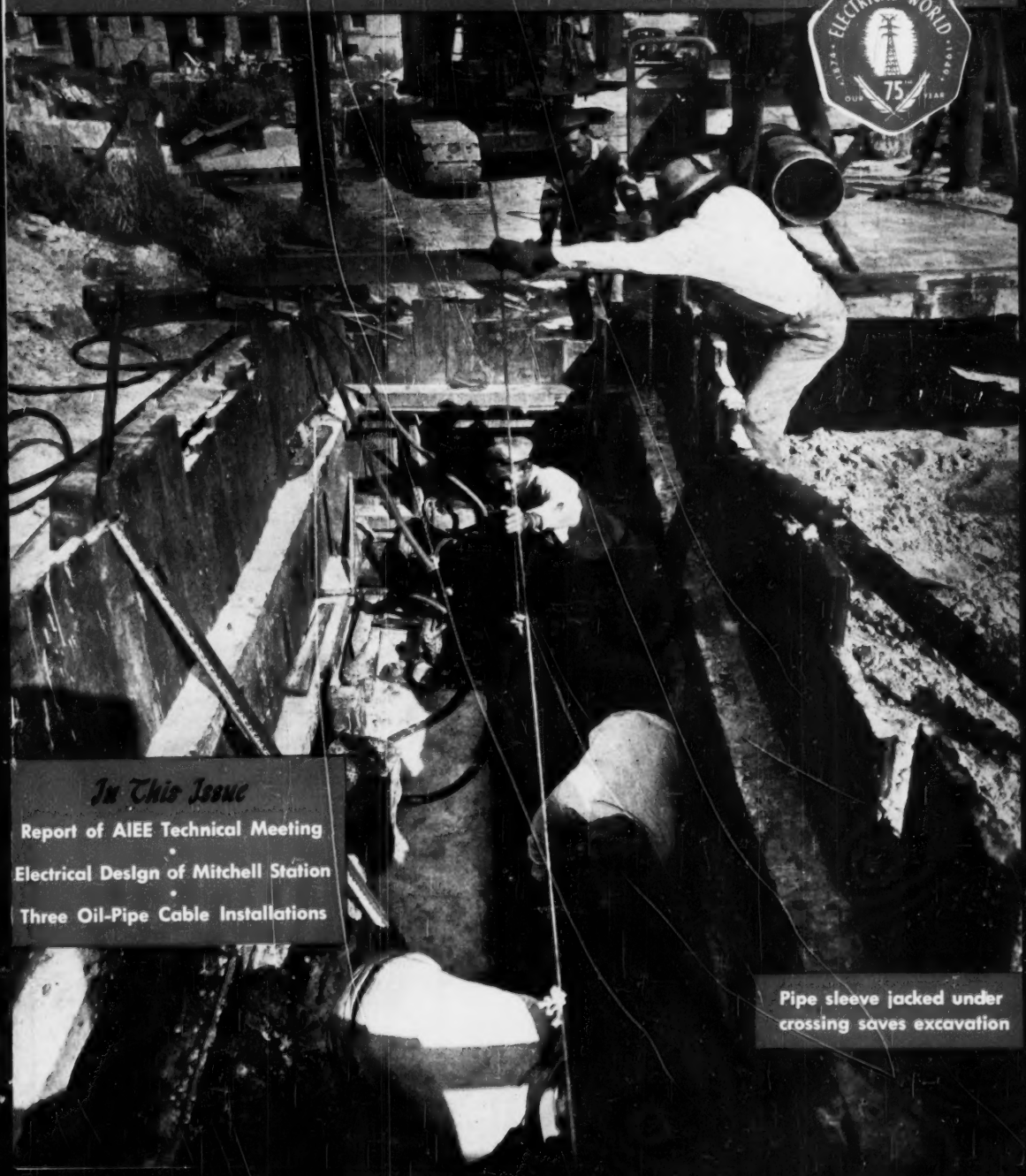
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

JULY 2, 1949



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Electrical Design of Mitchell Station

Three Oil-Pipe Cable Installations

Pipe sleeve jacked under crossing saves excavation

Why Use HEAT To Interrupt Overload CURRENT?

Heat and Current Are NOT the Same...

Heat Builds Up In

COMPACT PANEL BOXES

WARM ROOMS

DIRECT SUNLIGHT

Murray

FULLY MAGNETIC Circuit Breakers

are **NOT** Affected by Heat

Because they have

NO Thermal Element!

By using the *magnetic field*, which surrounds every current carrying conductor, Murray engineers have perfected a circuit breaker that assures dependable protection combined with freedom from temperature influences. Inverse time delay is effected by a simple, hermetically sealed, factory calibrated hydraulic piston.

No "Derating!"

Why be satisfied with breakers having erratically operating thermal elements . . . with breakers that often cannot even carry rated loads continuously . . . with breakers that must be "derated" in an attempt to prevent false tripping? Insist on Murray *Fully Magnetic* Circuit Breakers — the breaker that is independent of temperature because it has *No Thermal Element!*

Murray *Fully Magnetic* Breakers are available in 2, 4, or 8 breaker load centers. Each breaker can be *individually* replaced with breaker of same, lower or higher rating.

Single pole breakers in 10, 15, 20, 25, 30, 35 and 50 amp. ratings. Only two handle positions — Off and On.

CUTS SERVICE CALLS

Get the full facts on Murray *Fully Magnetic* Circuit Breakers. Operating characteristics and construction features are given in this informative folder. Write for your copy now.

FOR TOMORROW'S LOADS . . .

Equip Today!

FULLY MAGNETIC

Murray

MANUFACTURING CORPORATION

50 Years of Service to the Electrical Industry

1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS'NEST AERIAL LADDERS

ELECTRICAL WORLD

Published for 75 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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COVER PICTURE—At Tampa Electric, by jacking through 12-in. pipe sleeves for the oil-pipe cable, six railroad crossings were made without interrupting traffic or excavating railroad right-of-ways

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FACTS POINT TO

OKOLITE-OKOPRENE

FOR GENERATOR LEADS

THIS IS A SEGMENTAL CONDUCTOR. A 1,750,000 CM segmental conductor carries the same load as a 2,000,000 CM concentric conductor, costs less in all but short lengths, and is equally flexible, its improved design utilizing segment interstice fillers and additional tapes. Conductor: Okoloy-coated to prevent corrosion and shielded by Semicon tapes to prevent internal corona cutting on all cables operated at more than 2,000 volts between phases.

THIS IS A HEAVY WALL OF OKOLITE INSULATION. Moisture, ozone and heat-resistant, Okolite insulation has proved its stable electrical characteristics in voltages as high as 38 KV. Okolite has high dielectric strength and low power factor. Okolite-shielded-Okoprene cables are easy to terminate and contain no saturants or petrolatum to migrate, leak or give pressure trouble.

THIS IS METALLIC SHIELDING TAPE, insuring freedom from static discharge, preventing shock from accidental contact. Superior to semi-conducting braids in this respect.

THIS IS A NON-METALLIC SHEATH OF OKOPRENE, a tough, non-flammable neoprene covering developed by Okonite, which is unaffected by exposure to sunlight, weather, chemicals and fumes. Okolite-shielded-Okoprene construction eliminates lead sheath troubles due to corrosion, mechanical damage during installation, or fatigue.

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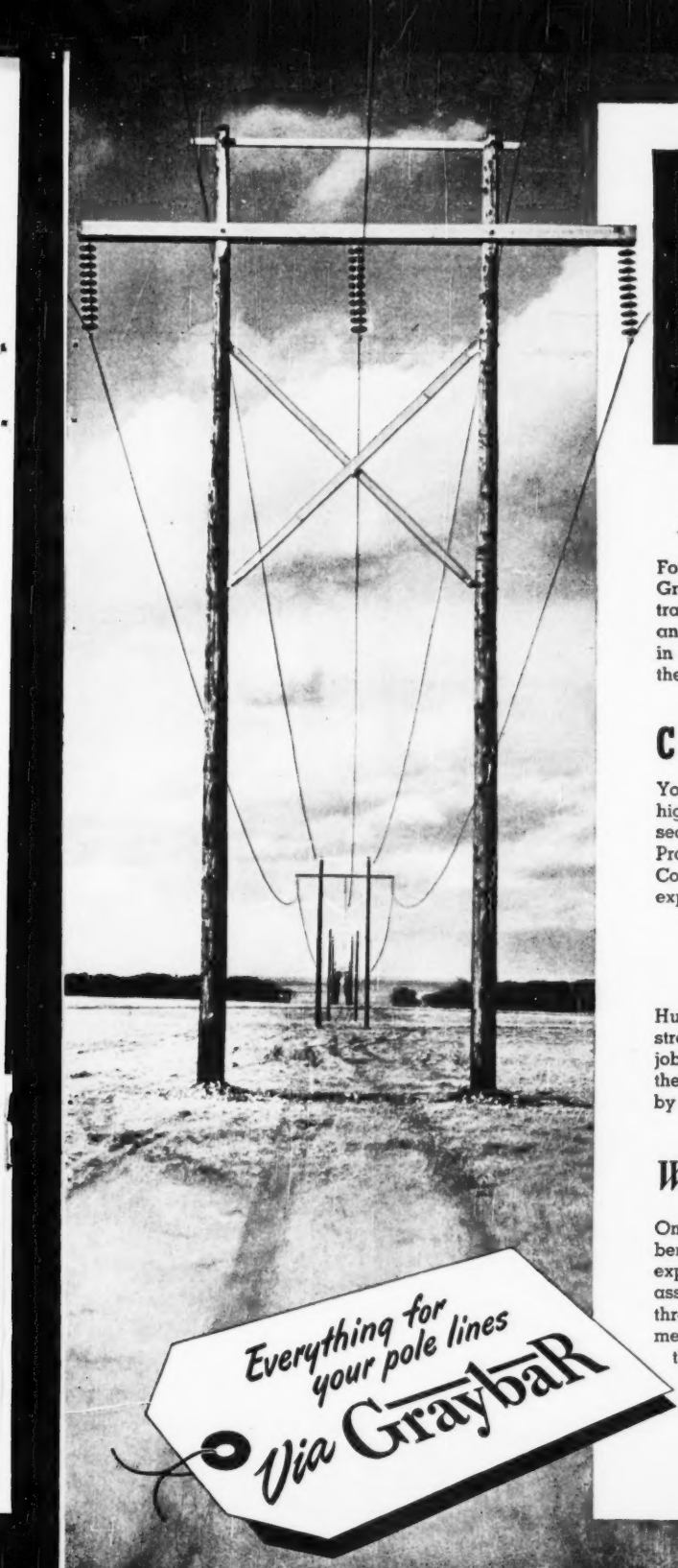
OKONITE insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY



NOTHING IS LACKING

for high-voltage lines

All the hardware

For constructing or maintaining high voltage lines, Graybar is ready with the full line of Hubbard transmission line hardware. Tested, tried, proved and improved on thousands of projects of all types, in all climates, Hubbard hardware adds years to the life expectancy of the line.

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You'll have the right crossarms and timbers for high-voltage line construction – all sound and fully seasoned—when you put your needs up to Graybar. Produced by American Crossarm and Conduit Company, they are selected and inspected by experts, and delivered "on schedule."

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Hubbard wood cross braces, to increase the strength of H-frame structures, are matched to the job when ordered via Graybar. Steel fittings on these braces are precision built, and are protected by long-lived double-dip galvanizing.

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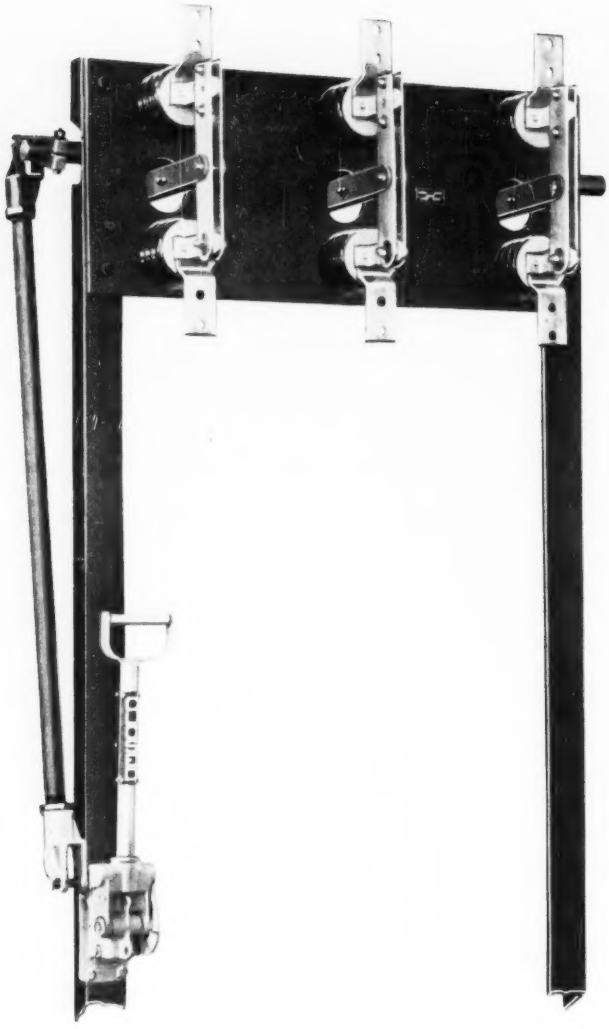
IN OVER 100 PRINCIPAL CITIES

Cole Electric Co.

8439 Steller Drive — Culver City, Calif.

TExas 0-4701

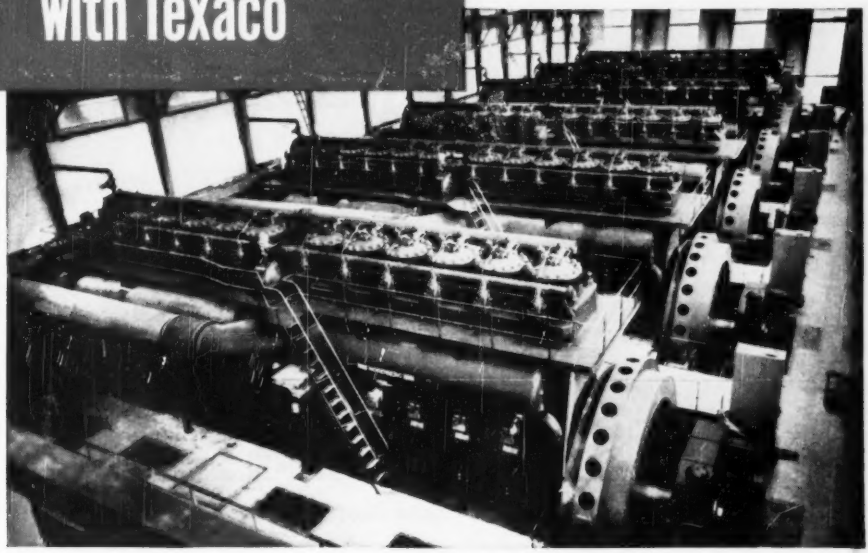


INDOOR DISCONNECTING SWITCH

7.5 K.V. 600 ampere Type X.U.
Three Pole, Single Throw
Remote Manual, Group Operated
(3 poles shown)
See Bulletin 10A

Mexico City's Giant New Diesel-Electric Plant Lubricated 100% with Texaco

Mexican Light and Power Company, Ltd., lubricates battery of "hemisphere's biggest" Diesel engines with Texaco Ursa Oils.



TEXACO congratulates the Cía. Mexicana Meridional de Fuerza S. A., subsidiary of the Mexican Light and Power Company, Ltd., on its completion of one of the biggest Diesel engine installations in the world. The six Nordberg 12-cylinder 8650 bhp. engines employed are the most powerful single-acting, two-cycle Diesels ever built in the Western Hemisphere.

Texaco Ursa Oils were chosen to lubricate these Diesels because they keep engines clean . . . rings free . . . ports open . . . resist oxidation and stand up under heat and pressure. That, in fact, is why—

More stationary Diesel hp. in the U. S. is lubricated with Texaco Ursa Oils than with any other brand.

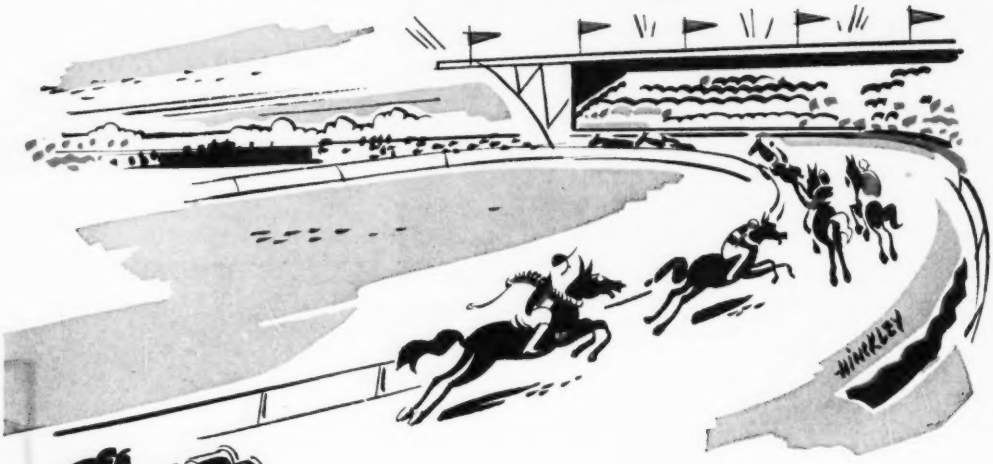
Texaco Ursa Oils are approved by leading Diesel engine manufacturers. Use them to reduce your Diesel maintenance costs and fuel consumption. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write: The Texas Company, 135 E. 42nd St., New York 17, N.Y.

TEXACO

TEXACO Ursa Oils

FOR ALL DIESEL ENGINES

YOUR CENTRAL RIGID STEEL CONDUIT DISTRIBUTOR MAKES YOU THE WINNER



• You win two ways when you place an order with your Central Rigid Steel Conduit Distributor. You're sure of conduit of unexcelled quality that's easy to bend, cut or thread and that provides maximum safety in any location. And the complete stock of Central Black, Cenlaco and Central White Rigid Steel Conduit carried by your distributor, makes it easy for you to get exactly what you want without delay.

For fast delivery of conduit or other electrical supplies, call your Central Rigid Steel Conduit Distributor . . . and be a double winner.

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CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

INSTANT BREAKER OPERATION UNDER ALL FAULT CONDITIONS!

MECHANICALLY TRIP-FREE action instantly releases contacts from closing force when closed on a fault . . . permits high contact acceleration *unhindered by closing cylinder back-pressure or toggle inertia* on pneumatically operated breakers. You get instant, complete contact opening under all tripping conditions.

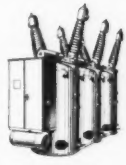
With this Allis-Chalmers electro-pneumatic operator, highest possible system stability and service continuity are maintained. The breaker cannot be held closed on a fault . . . and operator mechanism is quickly recoupled to permit fast reclosing — within 20 cycles. Pneumatic operation furnishes reliable, high speed contact closing — requires only fractional horsepower motor.

This mechanically trip-free operator is just one of many standard features you get on Allis-Chalmers oil circuit breakers. For details on any rating, contact your nearbv A-C representative. Or write direct.

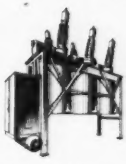
ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

A-2772

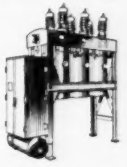
IT'S STANDARD EQUIPMENT ON THESE ALLIS-CHALMERS OIL CIRCUIT BREAKERS



TYPE BZO-160 . . . from 69 to 230 kv — 3 or 5-cycle opening, 20-cycle reclosing.



TYPE FZO-151 . . . 69kv . . . frame-mounted—5 or 8 cycle opening, 20-cycle reclosing.

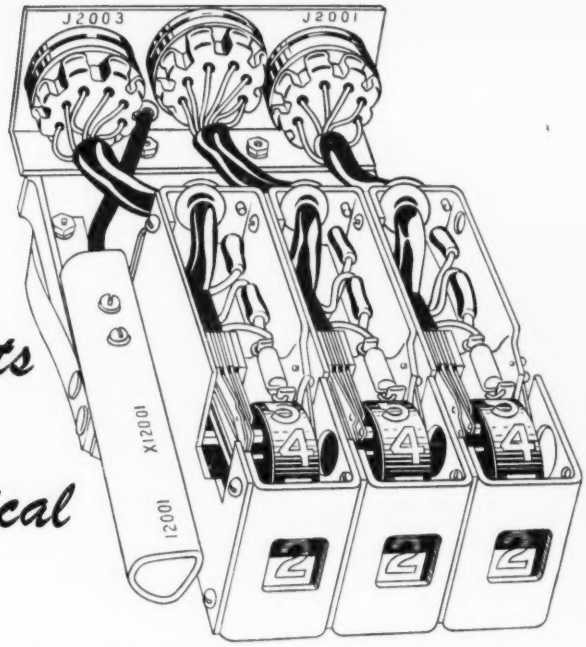


TYPE FZO-150 *Unitop* . . . 15 to 46 kv — 8-cycle opening, 20-cycle reclosing.

Unitop is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment From Generation Through Utilization



Insulation Counts in this Electro-mechanical Counter

When a high speed, electro-mechanical counter clicks away at 1200 counts per minute, insulation within the unit is subjected to a great amount of vibration and high heat radiated from the coil. Vital connections in the unit must be protected against insulation breakdown.

Ben Har Special Treated Fiberglas Tubing is used on the counter contacts and relay connections in the Electro-mechanical Counter made by Engineering Research Associates, Inc. because it meets specific insulation requirements fully and completely.

Here is what the makers of Electro-mechanical Counter reported:

"Considerable strain is imposed on the tubing due to the vibration generated in the counter. In addition, high heat is dissipated by the counter coil. Ben Har Special Treated Fiberglas Tubing was chosen for this job both for its mechanical strength and its heat insulating properties. Approval of Ben Har Special Treated Fiberglas Tubing by customers determined our choice of this tubing. Results have been very satisfactory."

If insulation breakdown is a problem in your product or plant, try Ben Har Special Treated Fiberglas Tubing. Remarkably flexible, it resists moisture, abrasion, wear and high heat. Will not crack or split when bent. Use it profitably in your product and in your plant. Write today for samples.

BENTLEY, HARRIS MFG. CO., CONSHOHOCKEN, PA.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

---------- USE COUPON NOW ----------

Bentley, Harris Mfg. Co., Dept. W-35, Conshohocken, Pa.

I am interested in Ben-Har Special Treated Fiberglas Tubing_____ (size or I.D.)

for_____ (product) operating at temperatures of____°F. at____volts. Send samples so I can see how Ben-Har Fiberglas Tubing stays flexible as string, will not crack when bent.

NAME_____ COMPANY_____

ADDRESS_____

Send samples, pamphlet and prices on other BH Products as follows:

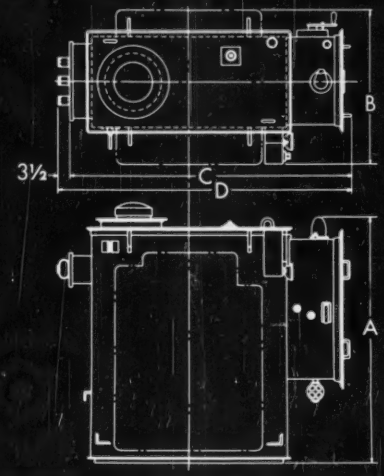
☐ Cotton or Rayon-base Sleeving and Tubing.

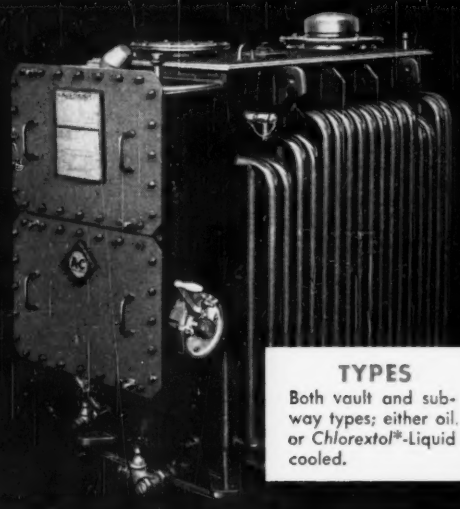
☐ BH Non-fraying Fiberglas Sleeving

ALLIS-CHALMERS NETWORK TRANSFORMERS

Fit Any System Needs!

DIMENSIONS





TYPES
Both vault and subway types; either oil, or *Chlorextol**-Liquid cooled.

	H.V. 5 KV CLASS				H.V. 15 KV CLASS				
KVA	A	B	C	D	KVA	A	B	C	D
300	60	37	67½	71	300	60	38	70½	74
500	65	40	74½	78	500	65	40	77½	81
750	76	42	80½	84	750	76	42	81½	85
1000	85	50	83½	87	1000	85	51	86½	90

RATINGS

300 kva 500 kva 750 kva 1000 kva
Available in H.V. Ratings 5 kv 15 kv 22 kv 33 kv
5 kv and lower — no taps (taps available at additional cost)
7200 v to 33,000 v — (4) 2½% taps below normal
L.V. 216Y/125, 4 Wire (standard)
199Y/115, 208Y/120, 213Y/123 (optional)

YOUR SYSTEM REQUIREMENTS can be met economically with Allis-Chalmers standardized Network Transformers. Special engineering is eliminated in most cases because *standard* A-C units, without modification, meet most system requirements.

Standardization of dimensions, and standard location of important accessories make it easy to interchange sizes in the event of future expansion.

Where required, modifications will be made to fit special system needs.

Get complete information by writing for bulletin 61B6152A. Or contact your nearby A-C sales representative.

ACCESSORIES

FLUSH TYPE LIQUID GAUGE is easy to read. High impact strength tempered gauge glass is given additional protection of heavy bronze cover.

THERMAL INDICATOR shows operating temperature as well as maximum reading . . . is specially gasketed for complete water-proofing.

AIR TEST VALVE with spring-actuated, self-closing arrangement gives positive protection against infiltration of foreign material.

LIQUID SAMPLING DEVICE used on *Chlorextol**-Liquid filled transformers is hand rotated to enable sample to be taken at liquid level.

TOP FILTER PRESS VALVE is located near drain valve for convenience. Internal connection is piped to diagonally opposite corner of tank, providing a cross flow to assure complete interchange of liquid.

RELIEF DIAPHRAGM on cover of *Chlorextol**-Liquid filled transformer protects transformer in the event of abnormal operating pressure.

COMPLETE DRAIN VALVE and bottom filter press connection. Special valve design permits accurate liquid sampling. A-2697

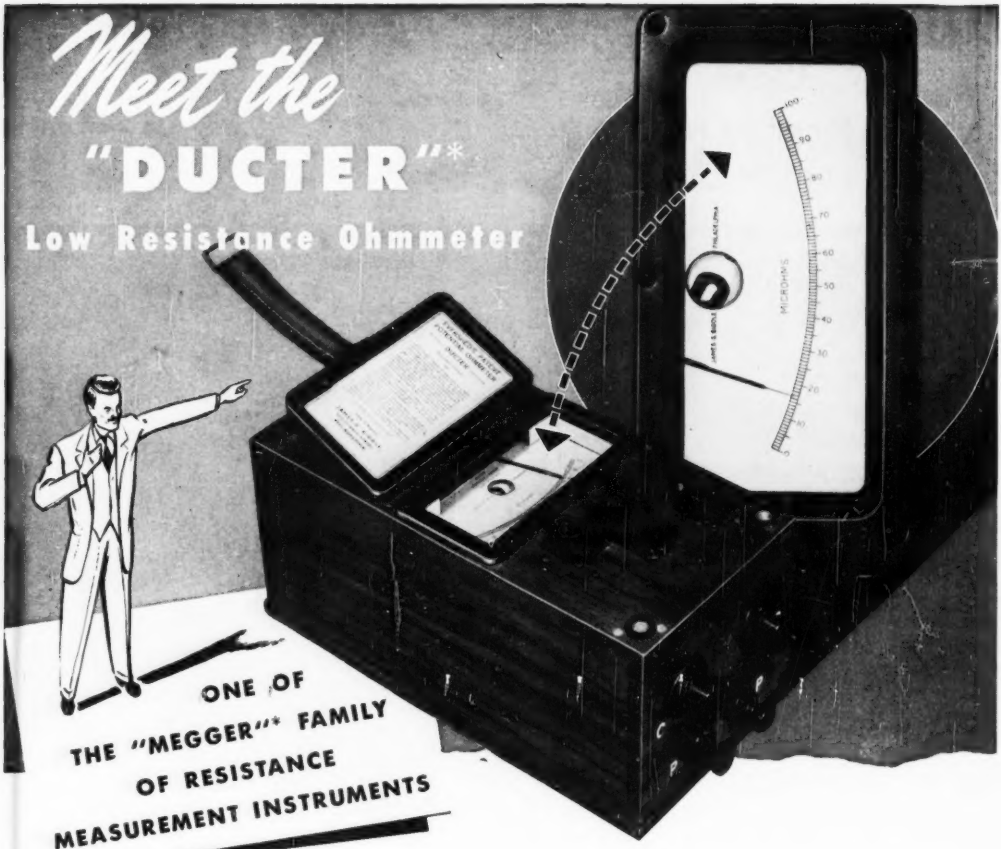
ALLIS-CHALMERS, 932A SO. 70 ST. MILWAUKEE, WIS.

*Non-inflammable insulating liquid.

Chlorextol is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Network Transformers—Nearly 1,000,000 KVA Installed



Rugged, accurate and direct-reading, the "Ducter" Low Resistance Ohmmeter provides an easy and practical way to test air and oil circuit breaker connections and contacts; cable joints; bus bar and line connections; armatures and series fields of generators, and motors; and low resistance transformer windings. It is also a valuable tool in quality control and for indicating relative strength and conductivity of welded joints.

One man can quickly make resistance measurements down to a millionth of an ohm—in the field! There are no calibrations or adjustments—not even for the voltage of the battery that supplies the necessary test current—and there are no calculations or charts. The resistance measurement is read directly from the position of the pointer on a scale.

The "Ducter" operates from an external battery or plug-in power supply. On every range it is compensated for outside temperature changes. As a protective feature a cut-out is included in the circuit to prevent application of too high voltage, and very high resistances or open circuits.

Various ranges of "Ducter" Ohmmeters are available to suit your requirements. A complete description, together with circuit diagrams, applications, and specifications are contained in Bulletin 24-25-W. Write for your copy TODAY and learn all about this truly remarkable instrument.

*REG. U. S. PAT. OFF.

JAMES G. BIDDLE CO.
Electrical & Scientific Instruments
1316 ARCH STREET, PHILADELPHIA 7, PA.

Wagner Distribution Transformers

are *Standardized*

to meet your requirements

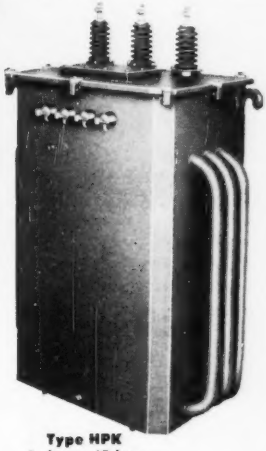
Type HEK
Single-phase
3 kva.

Wagner's complete line of distribution transformers includes every rating and design listed in the E. E. I.-NEMA Fourth Report! This means that you get the benefit of the improved design, quality construction and high efficiency of Wagner Transformers with *standardized* mechanical features in ratings of 500 kva and below—15,000 volts and below.

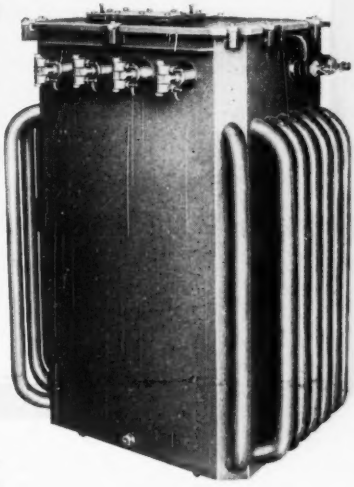
You save time, money and worry when you make your selection from Wagner's widely diversified line of distribution transformers — no matter what your particular requirements may be . . . there's one to fit your needs.

Type HEX
Single-phase
25 kva.

Type HEB
Single-phase
75 kva.



Type HPK
3 phase—45 kva.



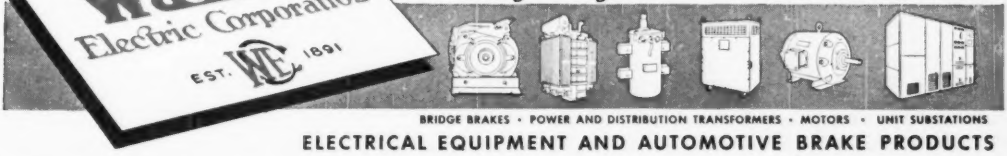
Type HPB
3 phase—112½ kva.

Wagner has a nationwide organization to provide fast, convenient service, with 29 branches located in principal cities ready to help you with your transformer problems. Bulletins TU-180 and TU-181 give complete information on Wagner Transformers.

T49-9

Wagner Electric Corporation
6455 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on All Transformer Problems

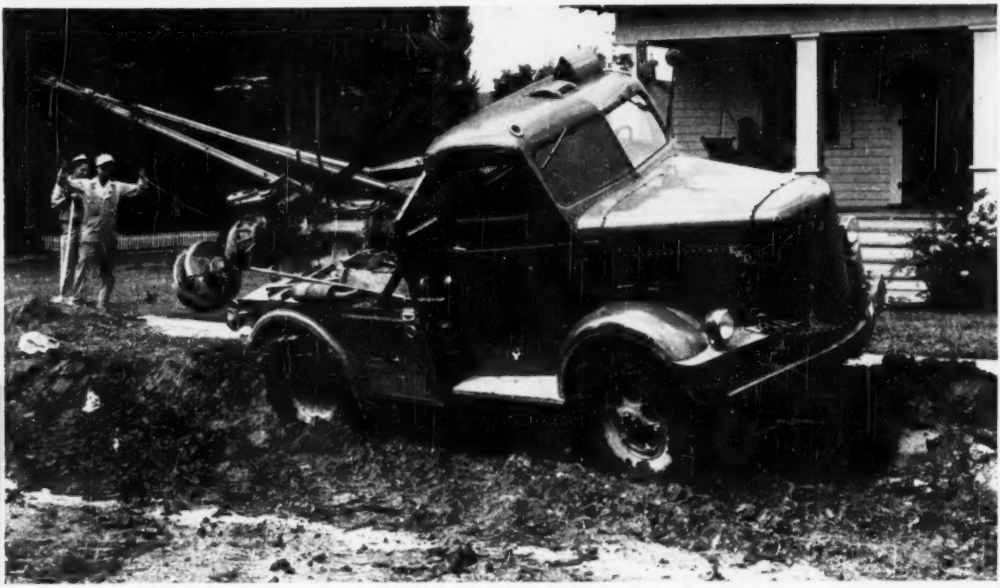


BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

PROOF - *not Guesswork*

Makes FWD America's Foremost Heavy-Duty Truck



Here's actual operating proof by one of the nation's leading utilities! This FWD line construction unit is doing an everyday job — going through mud and clay to get to location. Yes — power and dependability needed for tough jobs like this are built right into every FWD Built-to-Code unit. You can be sure of this — even before you buy, because FWD Four and Six Wheel Drive Trucks are scientifically tested on FWD's proving ground to plow through mud and clay that reach over the bumper. *No wonder over 200 of the nation's top utilities use FWDs — with individual fleets up to 192 units!*

WHAT FWDs DO ON THE PROVING GROUND
1 Highball over hilly curved roads!
2 Slog thru mud — up to the bumper!
3 Speed over 100-ft. unbanked circle!
4 Twist over ditches —18 inches deep!
5 Drive up 6% grade thru 3-ft. of sand!
6 Climb 70% grade from dead stop!
7 Climb 8-in. beam from standstill!
8 Drill pole holes to prove equipment!
9 Speed safely over level highways!
1
2
3
4
5
6
7
8
9

This is FWD's proving ground. This is your assurance that the FWD you select has the stamina to insure long life without expensive mechanical breakdowns.

An FWD slogs through the "mud hole" at the proving ground. For all the facts about FWD Built-to-Code units, see your Graybar distributor — or write FWD.

An Invitation To Truck Buyers

We invite you to watch FWDs pass a series of rigid performance tests. Ask your FWD distributor to arrange your visit to our plant. Or — if you can't get away, ask him to show you the movie, *The FWD Story*. In either case, you will see for yourself how FWD trucks can help solve your heavy-duty trucking problems.

Matter G. Klein
President
The Four Wheel Drive Auto Company

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wis. • *Canadian Factory:* Kitchener, Ontario
FOUR AND SIX WHEEL DRIVE TRUCKS

America's Foremost Heavy-Duty Truck

From DESIGN
TO DELIVERY
R&IE
CENTRALIZED
SUBSTATION SERVICE
Check the Facts
1 DESIGN layout, detail complete.
2 FABRICATION complete in R&IE shop.
3 GALVANIZING—new controlled methods.
4 SWITCH ASSEMBLY—from foundry and all machining operations, R&IE controls the entire manufacture ready for delivery.
5 VERSATILITY to solve any special problem. Illustration shows typical industrial application of R&IE design.
RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.
IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO
An I. T. & E. Organization

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

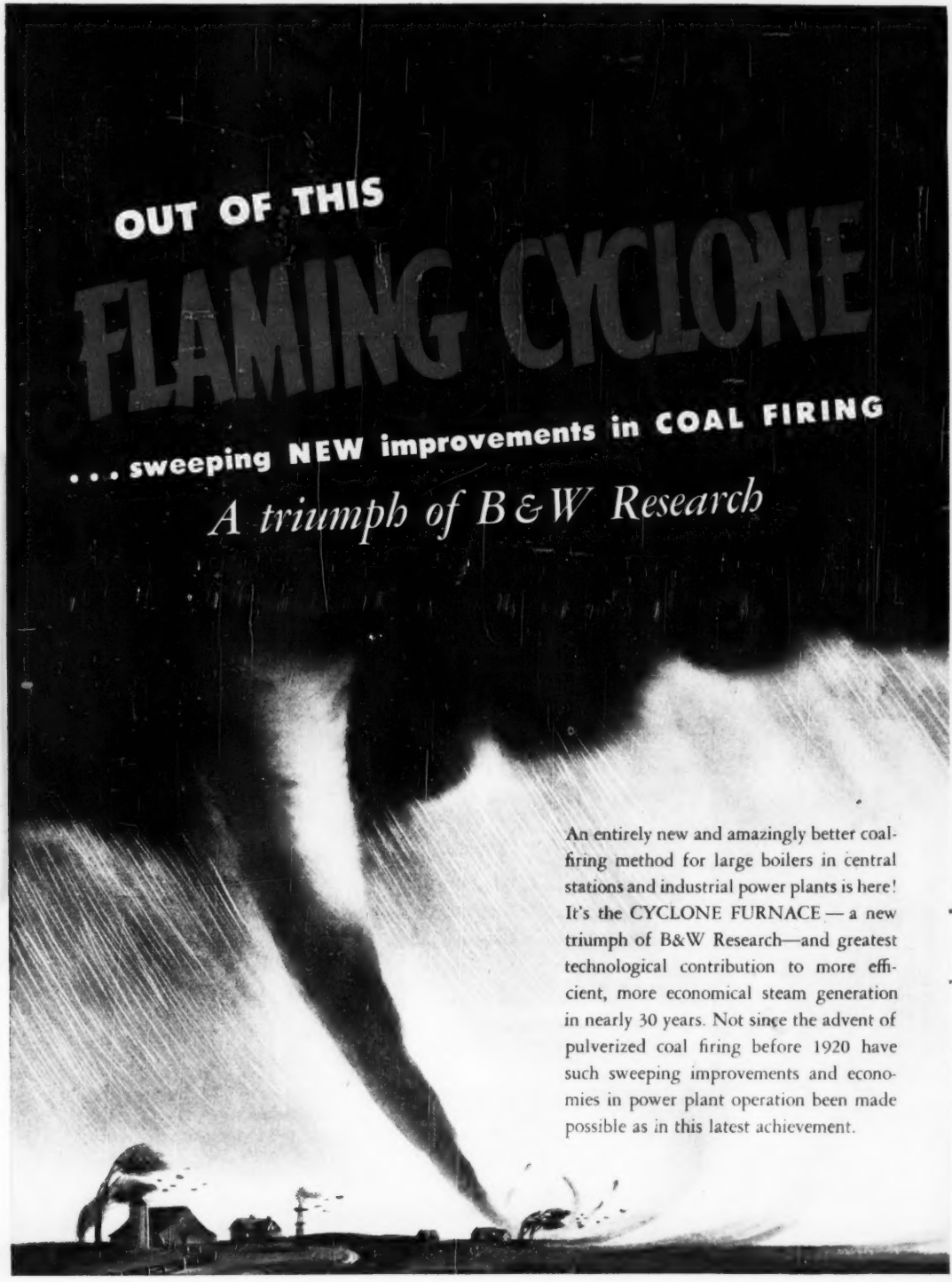
OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

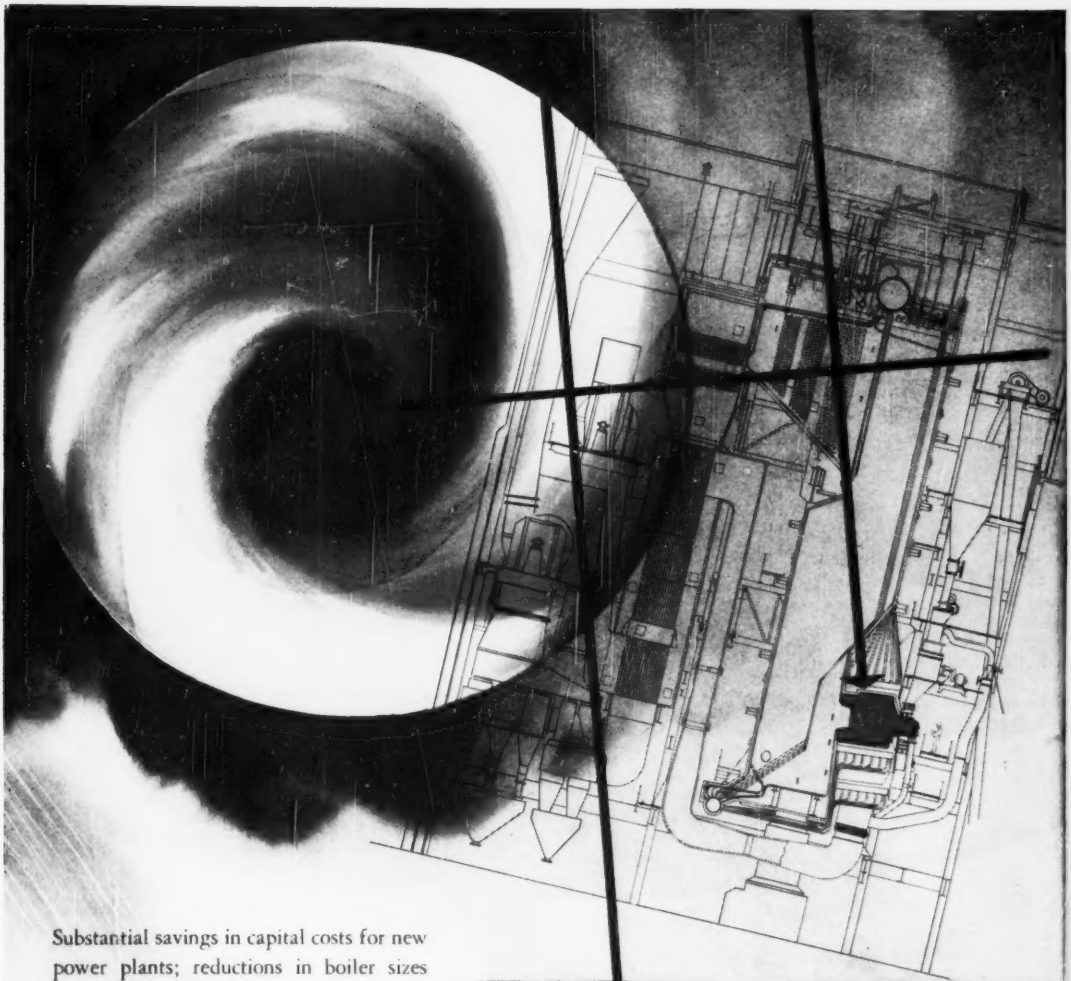
KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

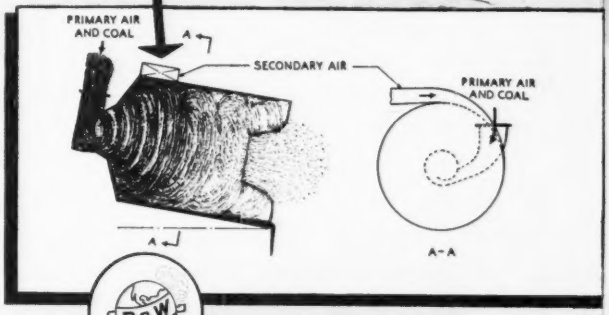
METAL CUBICLES

TESTING DEVICES


OUT OF THIS
FLAMING CYCLONE
. . . sweeping NEW improvements in COAL FIRING
A triumph of B&W Research
An entirely new and amazingly better coal-firing method for large boilers in central stations and industrial power plants is here! It's the CYCLONE FURNACE — a new triumph of B&W Research—and greatest technological contribution to more efficient, more economical steam generation in nearly 30 years. Not since the advent of pulverized coal firing before 1920 have such sweeping improvements and economies in power plant operation been made possible as in this latest achievement.



Substantial savings in capital costs for new power plants; reductions in boiler sizes and weights, and in building requirements; simplified ash handling; much less stack dust; elimination of large auxiliaries; less boiler maintenance . . . these are among the outstanding benefits in the wake of this revolutionary firing method. Thoroughly tried and tested for several years in actual service, the Cyclone Furnace has confirmed all advance claims with results that exceeded expectations.



B&W

BABCOCK & WILCOX

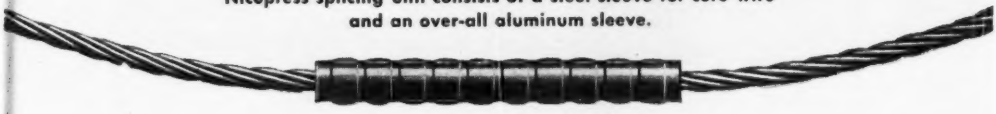
G-353T

Nicopress SLEEVES for A·C·S·R·

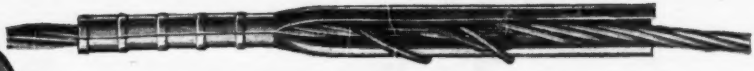
WILL GIVE YOU PEAK PERFORMANCE!

COMPLETED LINE SPLICE

Nicopress splicing unit consists of a steel sleeve for core wire and an over-all aluminum sleeve.



COMPLETED JUMPER SPLICE



REPAIR SLEEVE
(Partially Completed)

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

An important feature of the new Exide-Manchex Battery is the famous manchester positive plate with its unique lead button construction. The buttons, rolled strips of corrugated lead, are pressed into holes of the lead-antimony grid. Forming action expands the buttons and locks them securely in place. Only a comparatively small portion of the total lead is formed initially into active material . . . the remainder is available for gradual conversion in service.

Negative plates, separators and other elements are designed to match the long life and efficiency of the positive plates. All combine to provide a battery of exceptional power and long-lasting, trouble-free performance.

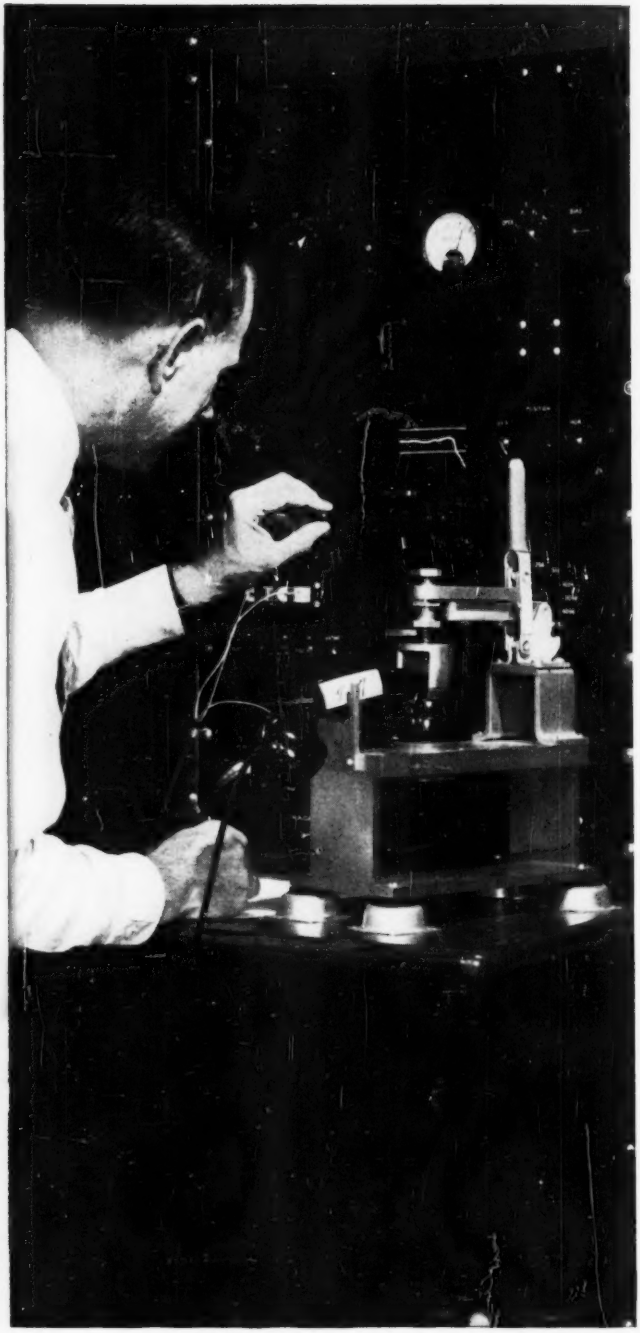
Use Exide-Manchex Batteries for switchgear and control bus operation, emergency light and power, and other storage battery services. It will provide up to 100% more capacity in the same given space.

"Exide" *Reg. Trade-mark U. S. Pat. Off.*

Exide
BATTERIES

1888 . . . DEPENDABLE BATTERIES FOR 61 YEARS . . . 1949

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*



Your telephone receiver should treat each tone in the voice alike; that is important to you, because proper balance makes pleasant listening and easy understanding. Naturalness in receiver performance is pictured in a matter of seconds by the apparatus shown at left.

The receiver is clamped in place and an oscillator feeds into it frequencies representing all talking tones. Then a bright spot darts across an oscilloscope screen leaving behind it a luminous line which shows instantly the receiver's response at each frequency. It is precise; and it is many times faster than the old method of measuring receiver performance point-by-point and then plotting a curve.

It listens so YOU can hear better

At Bell Laboratories, development of techniques to save *time* parallels the search for better *methods*. For each time an operation is made faster, men are freed to turn to other phases of the Laboratories' continuing job—making your telephone system better and easier for you to use each year.

BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.

PACIFIC ELECTRIC
Type YSW
SWITCHES

Carry the Load through Solid-Silver Rolling Contacts

Assure Cool Operation and Easy Opening

Special Ice-Breaking Features

Showing Type YSW, 46 kv, 600 amps, with Post-Type Insulators

N E M A Standards

TYPE YSW

Group-Operated Air Switches, Side-Break, Rotating-Insulator

7.5, 15, 23, 34.5 kv, 400, 600, 1200 amp.

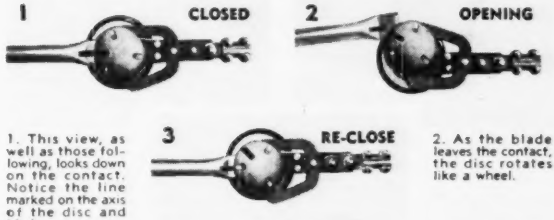
46, 69 and 115 kv, 600 and 1200 amp.

Several other styles of air switches also available—from 7.5 to 230 kv.

The Type YSW is selected for this month's advertisement because it is much specified by those wanting a top-quality side-break switch having but one rotating insulator per pole.

- Solid-silver inserts in rolling discs permit high-pressure contact (adjustable up to 80 lb), yet assure easy opening or closing.
- Floating self-aligning roller-contact design, as illustrated, assures easy operation, always.
- Ice is broken progressively because discs swivel sideways before starting to rotate.
- Rotating insulators have widely spaced ball or roller bearings with weather shields. All parts non-ferrous above insulator caps.
- Operating linkage for 3- or 6-pole switch has stainless-steel pins and mostly anti-friction sleeve or roller bearings.

How the Exclusive Rolling Contacts Reduce Friction, "Run" Cooler, and Assure Easier Operation



1. This view, as well as those following, looks down on the contact. Notice the line marked on the axis of the disc and blade.

2. As the blade leaves the contact, the disc rotates like a wheel.

3. The next time the blade enters contact, an entirely new contact position is presented to the blade.

Get All Facts . . .

Send for Catalog 130

Call

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • P. O. BOX 419, GARY, INDIANA

C. H. CUTTER, 912 Securities Bldg., Seattle 1, Wash. · PIERCE G. FREDERICKS, 90 West St., New York 6, N. Y. · J. E. REDMOND SUPPLY CO., 625 W. Madison St., Phoenix, Ariz. · ORMONDE SMITH, JR., 3842 Palm Ave., Houston 4, Texas · MARRS & WENDEGATZ, 526 Dwight Bldg., Kansas City 6, Mo. · L. CLAIR MITCHELL CO., 306 Commonwealth Annex, Pittsburgh 22, Pa.

F. W. GORMAN ELECTRICAL EQUIP. CO., P. O. Box 223, El Paso, Texas · G. B. KIRKWOOD, 14547 Madison Ave., Cleveland 7, Ohio · ARKANSAS ELECTRIC CO., 437 S. Hill St., Los Angeles 13, Calif. · WILLIAMSON & WILMER INC., 316 Louisiana St., Little Rock, Ark. · LEONARD M. SLUSSER, 617 Mutual Bldg., Richmond 19, Va. · 318 Dooly Block, Salt Lake City 1, Utah

Other Representatives in Principal Cities

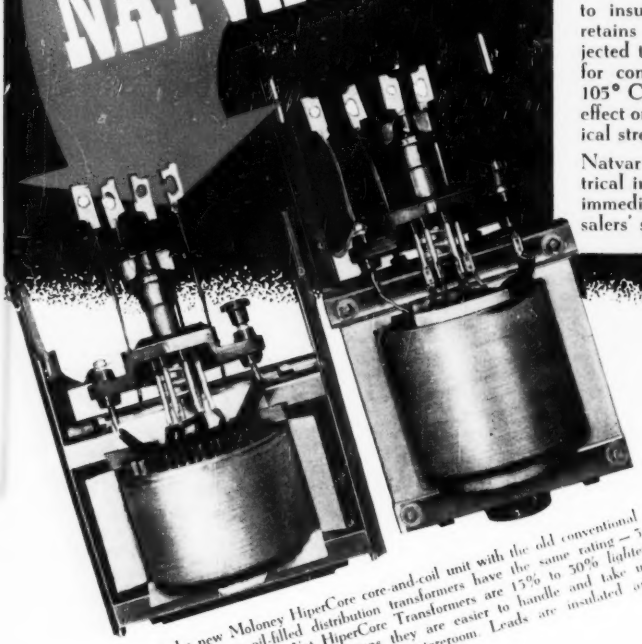
MOLONEY ELECTRIC'S NEW *HiperCore* TRANSFORMER HAS LEADS INSULATED AND PROTECTED *with* NATVAR 400

THE new HiperCore Transformers manufactured by Moloney Electric Company, St. Louis, are lighter and smaller than their predecessors, and yet have improved performance characteristics. They provide better voltage regulation and permit greater short-time overloads.

Cores are wound of high permeability, oriented silicon steel having 30% to 50% greater flux carrying capacity than hot rolled core steel, making it possible to decrease the amount of steel, copper and other materials, and at the same time improve operating characteristics.

Natvar 400 Extruded Vinyl Tubing is used to insulate and protect leads because it retains its original properties when subjected to *both heat and oil*. It is approved for continuous operating temperatures of 105° C. and immersion in oil has no adverse effect on its flexibility, dielectric, or mechanical strength.

Natvar 400 and other Natvar flexible electrical insulating materials are available for immediate delivery, either from your wholesalers' stocks, or direct from our own.



Compare the new Moloney HiperCore core-and-coil unit with the old conventional type. Both of these oil-filled distribution transformers have the same rating — 5 Kva, 7200-120/240 volts. Yet HiperCore Transformers are 15% to 30% lighter and up to 30% smaller, which means they are easier to handle and take up less space on the line truck and in the storeroom. Leads are insulated and protected with Natvar 400.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubings and sleevings
- Varnished identification markers
- Lacquered tubings and sleevings
- Extruded vinyl tubing and tape
- Extruded vinyl identification markers

Ask for Catalog No. 21

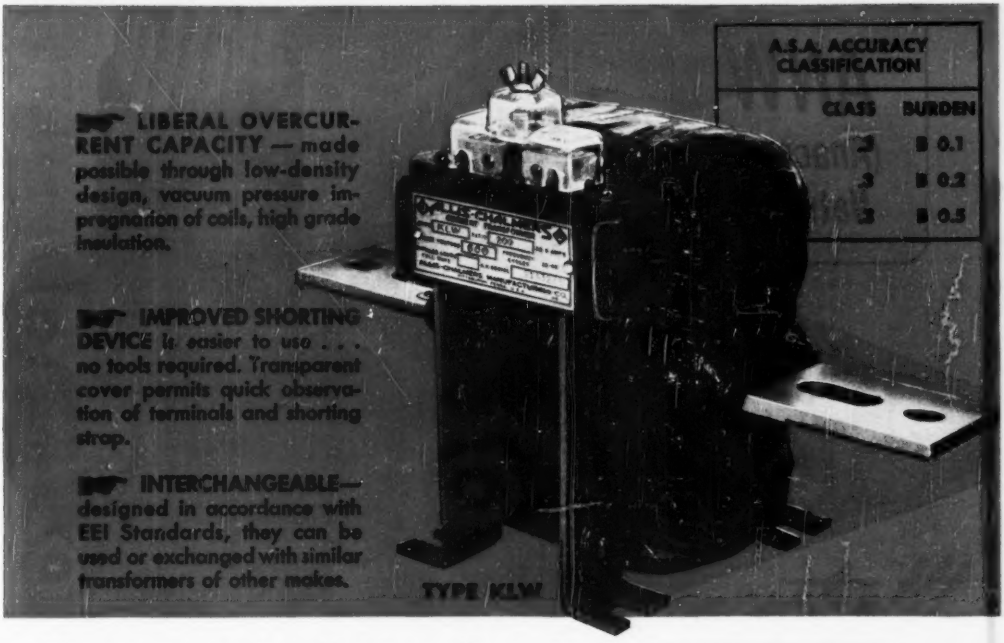
THE NATIONAL VARNISHED PRODUCTS *Corporation*

TELEPHONE
RAHWAY 7-2171

CABLE ADDRESS,
NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE ★ WOODBRIDGE, NEW JERSEY

NEW!... 600 Volt Current Transformer


A.S.A. ACCURACY CLASSIFICATION
CLASS BURDEN
.3 B 0.1
.3 B 0.2
.3 B 0.5
LIBERAL OVERCURRENT CAPACITY — made possible through low-density design, vacuum pressure impregnation of coils, high grade insulation.
IMPROVED SHORTING DEVICE is easier to use . . . no tools required. Transparent cover permits quick observation of terminals and shorting strap.
INTERCHANGEABLE— designed in accordance with EEI Standards, they can be used or exchanged with similar transformers of other makes.
TYPE KLW

THE NEW TYPE KLW is designed for indoor metering on circuits up to 600 volts. Accuracy is suitable for use with one or two watt-hour meters; continuous overload to 150% on 400 ampere rating, and to 200% on the 200 and 600 ampere rating.

NEW TYPE KLW ROUNDS OUT LINE

The KLW is an important addition to Allis-Chalmers' expanding line of instrument transformers — now more than 400 types and ratings from which to select. Complete interchangeability of units in like voltage classes is important too, because it means simplified stocking, lower inventory.

Send coupon for new bulletin giving complete information on the KLW and *all other* instrument and metering transformers in A-C's extended line. Or call your nearby A-C sales representative.

THERE'S AN "A-C" INSTRUMENT OR METERING TRANSFORMER FOR EVERY NEED!

CURRENT TRANSFORMERS — primary amperes from 10 to 10,000 max.; up to 69 kv.

POTENTIAL TRANSFORMERS — up to 69 kv primary volts (line to line).

A-C ALLIS-CHALMERS

A-2732

ALLIS-CHALMERS, 932A SO. 70 ST. MILWAUKEE, WIS.

Please send new, complete Instrument Transformer bulletin 6187168.

Name

Title

Firm

Address

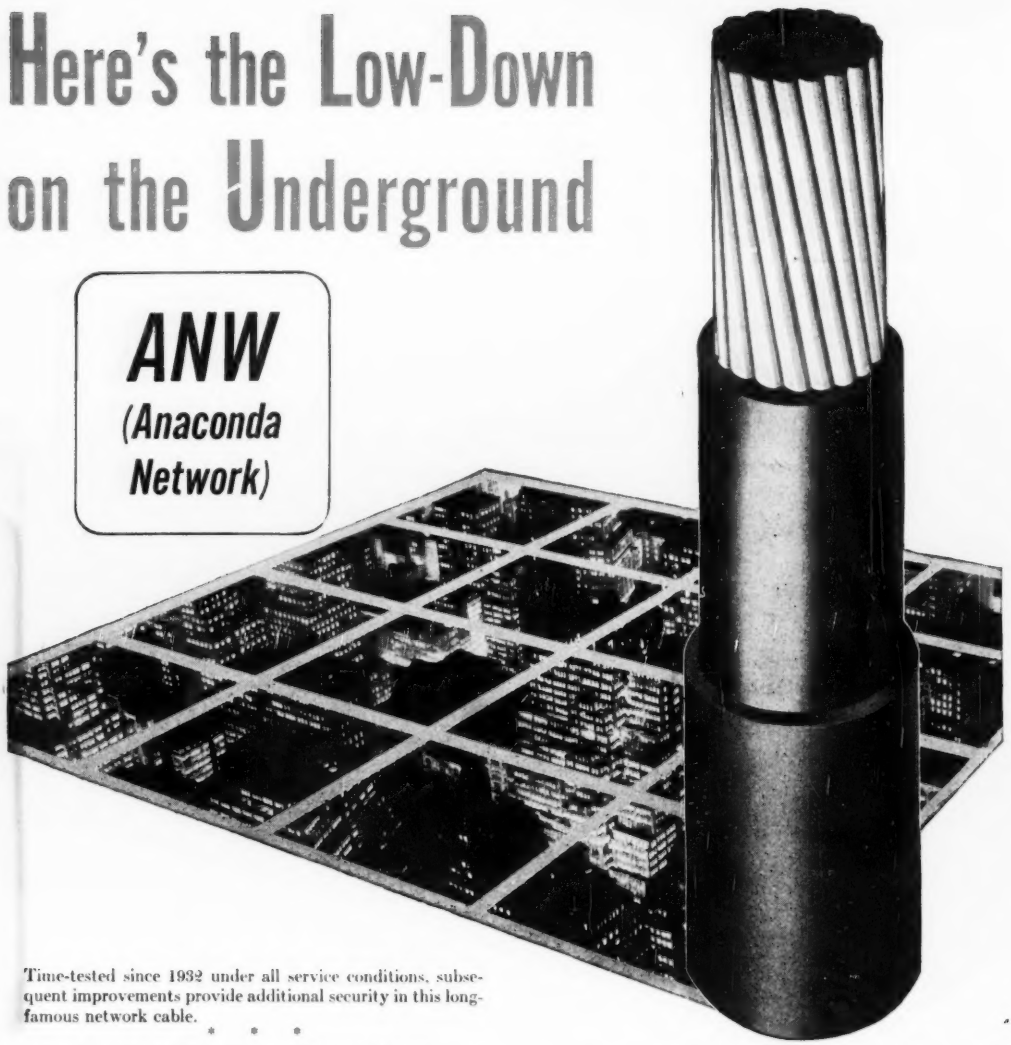
City State

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

Here's the Low-Down on the Underground

ANW (Anaconda Network)



Time-tested since 1932 under all service conditions, subsequent improvements provide additional security in this long-famous network cable.

* * *

Tough, easily handled, Type ANW-insulated, neoprene-jacketed cable incorporates six important advantages . . . important to you for underground duct installation.

1. Better heat and flame resistance—protected by the same neoprene jacket as Anaconda mining cables which must and do meet the severe flame test of the U.S. Bureau of Mines.

2. Higher resistance to duct acids and alkalies—years of experience with Type ANW insulation with only a braid covering showed it to be highly resistant to oils, acids and alkalies encountered in soil and sewage waters. NOW it has the additional protection of the neoprene jacket which itself has shown by test and experience, excellent resistance to these agents of destruction.

3. Higher operating temperature—now 75 C copper temperature, continuous duty.

4. Superior aging—Type ANW insulation has demonstrated year after year . . . and now even better . . . long-aging characteristics under severe oxygen bomb and air bomb tests.

5. Low Moisture absorption—Type ANW insulation has always had low moisture absorption . . . far less than is detrimental to safe operation.

6. More easily handled—passes 180 degree cold-bend test at 0 C without damage to jacket. Cable is lighter, easier to pull. No lead to fuse, insulation and jacket do not support combustion.

ANACONDA

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4, N. Y.

Now here's a Connector!!!

It's a Servit. We might call it a split-bolt, a "bug" or even a BURNDY. Mister, I call it a *real* connector.

I can't begin to remember how many thousands I've used. One thing sure—they make my job easier.

If I'm making a tap or a service connection just give me a SERVIT and a wrench.

If you're a "Doubting Thomas" try them . . . see for yourself how SERVITS save and serve!

Connect with

BURNDY

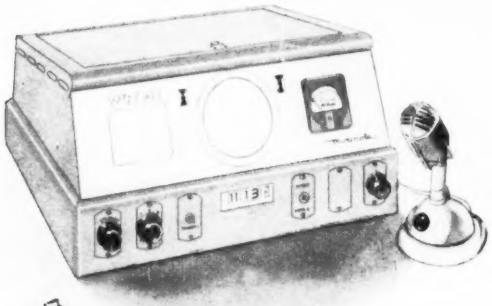
New York 54, N. Y.

WESTERN BRANCH: Vernon 11, California
CANADA: Canadian Line Materials, Ltd., Toronto 13

Motorola meets the challenge!

announces the new "RESEARCH LINE"

solves the ADJACENT CHANNEL PROBLEM



TODAY! The modern, the scientific, the ideal mobile radio communications equipment is here.

RESEARCH, experimentation, development, and field testing in systems operation produced this scientific answer to the adjacent channel operations problem.

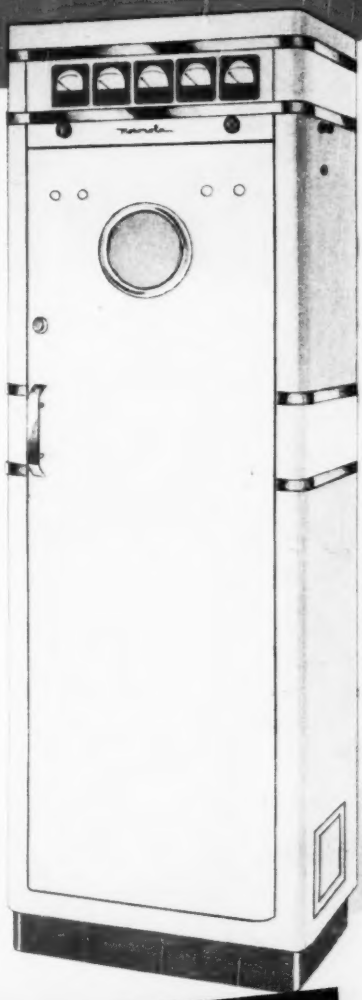
The minor problem of super-precision selectivity was solved in six months, but two years of research and the creation of five major inventions were required to solve the major problem of intermodulation before same-area adjacent channel operation became practicable.

Here is equipment that is new all through, with the new amazing circuit inventions which provide a new standard of performance for the industry.

HERE IS EQUIPMENT to give you the most modern communications system you can own—actually anticipating the standards of good engineering practice for the future. This startling departure from the conventional, offering new simplicity of maintenance, and a new standard of reliability—this engineering and scientific achievement is the new **MOTOROLA** "Research Line":

these "8" essential Motorola inventions make ADJACENT CHANNEL OPERATIONS *practicable . . .*

- SENSICON CIRCUIT (PAT. PENDING)
- ISO-Q CAVITIES (PAT. PENDING)
- STATOMIC OSCILLATOR (PAT. PENDING)
- PERMAKAY FILTER (PAT. PENDING)
- BRIDGE BALANCED OVEN (PAT. PENDING)
- CAPACITANCE DISCRIMINATOR (U.S. PAT. 2,404,359)
- DIFFERENTIAL SQUELCH (U. S. PAT. 2,343,115)
- I. D. C. SLOPE FILTER (PAT. PENDING)



THE SENSICON CIRCUIT

A radical departure from conventional receiver design to achieve control of intermodulation, the major barrier to successful adjacent channel operation. The Sensicon Circuit is the name given to the practicable embodiment of an invention which will change profoundly all future communication receiver design. The Sensicon Circuit is a MOTOROLA "first" (Patents Pending).

I.D.C.

Consider the Sensicon Circuit, the Permakay Filter, the Statomic Oscillator, and the Iso-Q Cavities, and then add to all these the Instantaneous Deviation Control (Patent Pending) to keep the modulated transmitter radiation within the channel boundaries and you have the formula which answers the adjacent channel problem. Not one, but all of these inventions are necessary for practicable, trouble-free systems operation.

THE PERMAKAY FILTER

The super-precision selectivity of the Sensicon receivers, 100 db. down at the edge of the adjacent channel, is achieved by the Permakay Filter (Patent Pending). Cast in a solid block of polyester styrene, sealed against moisture, vibration and change, this unit is guaranteed for the life of the equipment.

THE STATOMIC OSCILLATOR

Single-cycle frequency control provided by the stable automatically compensated crystal circuit, stops drift and holds the signal perfectly.

ISO-Q CAVITIES

Silver plated, sealed, thermally compensated Iso-Q Receiver Cavities (Patent Pending) freeze the selection of the desired signal.

Remember! Selectivity alone is not the answer to adjacent channel operation. The integrated systems combination of these new inventions is the modern engineering answer to full channel utilization.

the BEST is now BETTER than ever before . . .

COMPARE feature for feature with any other equipment on the market . . . **GET THE COMPLETE STORY . . . Mail this coupon TODAY**

MOTOROLA INC., Communications Division
4545 Augusta Blvd., Chicago, Ill. Dept. EW-July 2

Name .....

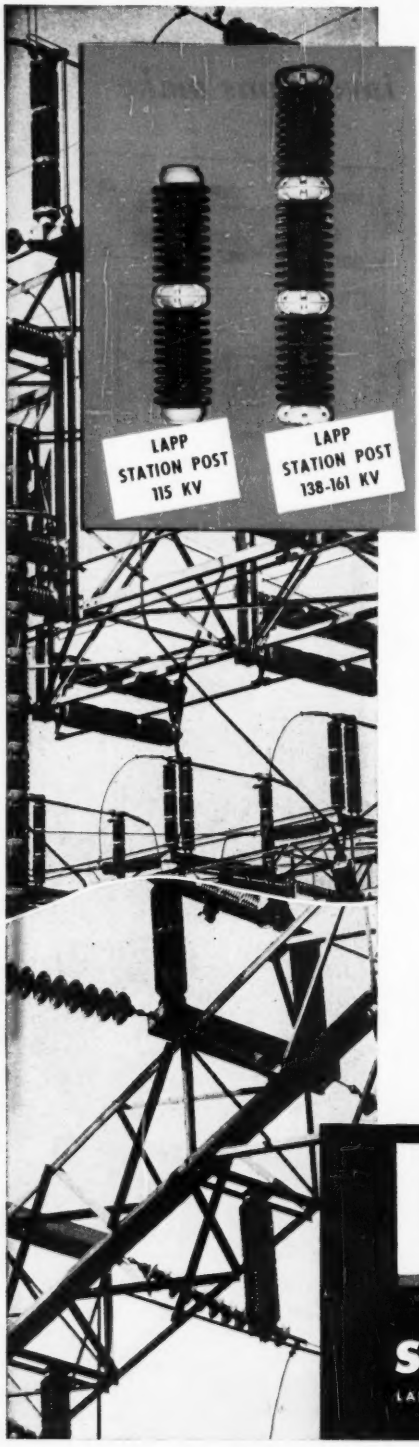
Position .....

Firm .....

Address .....

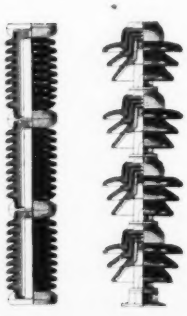
City ..... Zone..... State.....

Motorola FM 2-WAY RADIO



LOOK BETTER...
PERFORM BETTER...
LAST BETTER...
LAPP STATION POSTS
AT 115-161 KV

● In the 17 years since the introduction of the Lapp Post design, more and more companies have switched their construction standards to Lapp Line Post and Station Post insulators. It's not just that these modern insulators look up-to-date. They perform better and last longer—cause fewer outages—require less maintenance. Countless operating records prove the claims for Lapp Post insulators—better performance under arcover and under dirt conditions, elimination of puncture and cracking, greater rigidity in any mounting position.

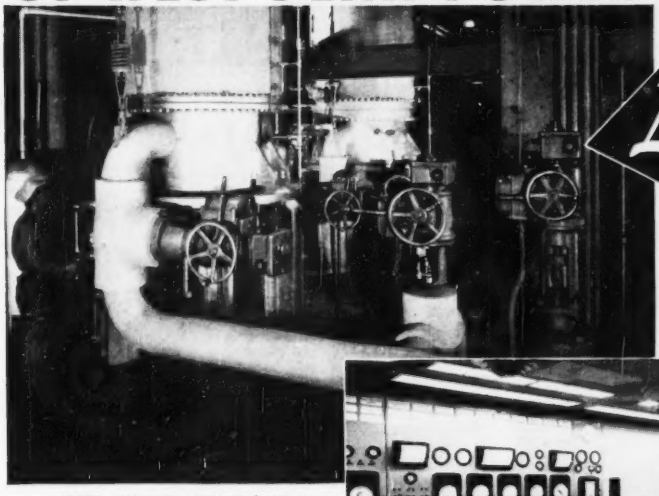


COMPARE

Sketched at left are a Lapp Station Post and a conventional pin-type switch insulator—both for service at 138-161 Kv. Post construction calls for *six* cemented joints, metal caps *externally* attached—large-area low-intensity compression loading on porcelain. The pin-type has *twelve* nested porcelain parts, all small-area high-intensity loading depending on tension strength of porcelain—its weakest characteristic. You'll save trouble and improve operating records when you switch to Lapp Posts—for all voltages up to 161 Kv.

Lapp
STATION POSTS
LAPP INSULATOR CO., INC. • LE ROY, N.Y., U.S.A.

MITCHELL STATION
OF WEST PENN POWER COMPANY...



ABOVE: High pressure feedwater heater, rear, and intermediate heater, foreground, are valved so that either heater can be by-passed.

RIGHT: Control for all boilers and turbine-generators, including *Limitorque Valve Operators* is concentrated at this central point.

ALSO USES *Limitorque*

MOTOR OPERATED
VALVE CONTROLS

Hundreds upon hundreds of valves on land and sea—for every conceivable use, are being safely, speedily and dependably opened and closed by "*LimiTorques*", day in and day out.

"Mitchell Station," the latest operation of the West Penn Power Co., is located at Courtney, Penna., on the bank of the Monongahela River . . . when completed it will develop in excess of 320,000 K.W.

As in many other nationally known Central Stations throughout America, *Philadelphia LimiTorque Valve Operators* will be used; in fact, a total of 35 type "S" *LimiTorques* will be installed for Steam and Water Lines on opening, closing and throttling service. Sizes of valves range from 6" to 48" and from 125# series to 1500# series.

The Valves in this station actuated by *Limitorque Controls* were manufactured by: Chapman Valve Mfg. Co.; Kennedy Valve Mfg. Co.; Walworth Co., and Northern Equipment Co.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Installing electrical conduit?

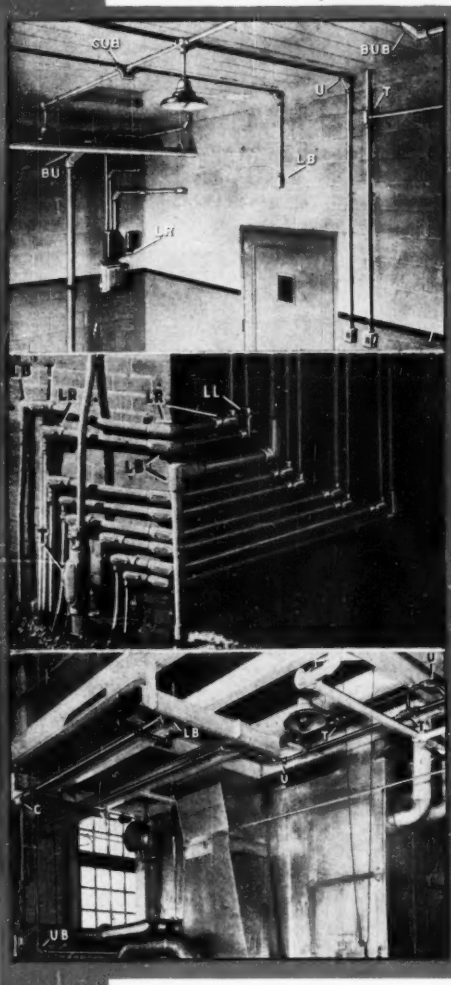
It's much **easier** with

Obround CONDULETS*

because they are so handy and there are

49 different types

A wide variety of interchangeable covers and wiring devices with Crouse-Hinds' exclusive Wedgenut Fastener; sizes to fit ½ to 6-inch electrical conduit.



A Nationwide Distribution Through Electrical Wholesalers

* *CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

The complete Obround Series, together with 15,000 other items for the electrician, is listed in Crouse-Hinds Condulet Catalog.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City
Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle
St. Louis — Washington. *Resident Representatives:* Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

Everybody's Pointing to Hotpoint's "Pushbutton-Cooking"

Hotpoint's Latest Triumph Sets New Sales And Production Records As Thousands Cheer Sensational Pushbutton Controls And Wonderful "Talking Colors"

NEVER before a range with such features! Never before a selling theme so powerful! Hotpoint's revolutionary Automatic Electric Range with sensational "Pushbutton Cooking" is writing the greatest success story in range history.

● Dealers have 36 outstanding features as sales clinchers—in addition to Hotpoint's Pushbutton Controls, "Talking Colors" and world-famous Calrod® Units. Dealers get aggressive, year-round advertising support in leading magazines and newspapers—plus solid merchandising aids that spell P-R-O-F-I-T. No wonder they call Hotpoint the franchise with a future! Hotpoint Inc. (*A General Electric Affiliate*), 5600 West Taylor Street, Chicago 44, Ill.

Hotpoint makes a range to fit every customer's budget—six models in all—equipped with either Pushbutton Controls or Rotary Switches.

Everybody's Pointing To

Hotpoint

RANGES • REFRIGERATORS • WATER HEATERS • FREEZERS • DISHWASHERS • DISPOSALS® • CLOTHES WASHERS • DRYERS • IRONERS • CABINETS AND SINKS

that big question of **GOOD INSULATION**

. . . was settled many years ago in the mica field, when engineers, specification writers and purchasing executives began to connect the name MACALLEN with MICA that was supreme in the qualities that made this extraordinary insulation material do an even better job than nature intended. Qualities such as variety and adaptability of shape, uniform thickness, flexibility, dielectric or other wanted characteristics. So — to product planners who realize that the importance of good mica is way out of proportion to its low cost in an assembly, mica has to mean MACALLEN MICA . . . . . not some of the time, but all of the time.

DEPENDABILITY

is just another reason why MACALLEN MICA is way out ahead . . you save time and trouble because of uniformity, cut assembly costs, increase profits.

MACALLEN MICA

ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

when you think of MICA, think of MACALLEN

THE MACALLEN COMPANY 16 MACALLEN STREET • BOSTON 27, MASS.
CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE

NOW L-M GUY CLAMPS

with *New* TORKOL-*Treated Nuts*

have 2.7 times the clamping power

Plus

- nuts go on more easily
- vibration does not loosen nuts
- rusting of nut threads is greatly reduced—nuts come off more easily, and may be reused

WHAT TORKOL IS AND WHAT IT DOES

TORKOL is an exclusive L-M product applied to the nuts of L-M guy clamps. It is a lubricant that increases the effective clamping power from 2.7 to 3.3 times for any given amount of torque.

Proved by 5 Years of Field Testing . . .

now adopted as standard for these reasons:

TORKOL does not creep or flow to adjacent electrical contacting parts under normal outdoor temperatures; it is not affected by weather changes or rain or sleet.

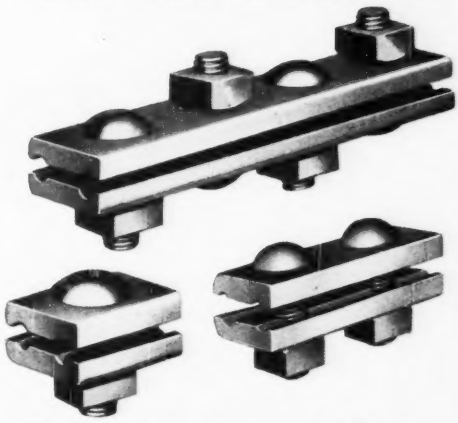
TORKOL is not appreciably displaced when the nut is tightened. Therefore it protects the threads from damage and rusting, permitting easy removal of the nut when desired. And nuts may be reused.

Vibration does not loosen **TORKOL**-treated nuts.

TORKOL is clean, dry. It does not discolor hands, gloves, or clothing. It does not collect dust.

ALL L-M guy clamps are furnished with **high strength bolts.** Nuts only are treated with **TORKOL**, which is colored yellow for identification.

L-M GUY CLAMPS



Heavily galvanized steel, in one to four bolt sizes, from $1\frac{7}{16}$" to 8" long, light or heavy weight, for wires from $\frac{3}{4}$" to $\frac{7}{16}$". Furnished with high strength bolts and **TORKOL**-treated nuts, at **NO extra cost.**

Bolts are opposed as shown. Oval holes in both plates permit inverting the oval shank bolts. Smooth grooves with rounded ends prevent damage to wire.

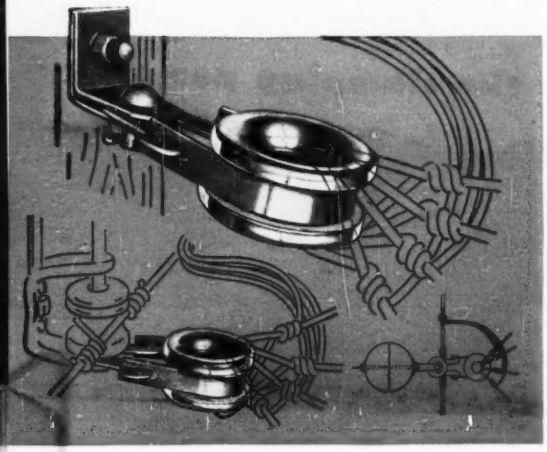
For details on these and other clamps, and samples of **TORKOL**-treated nuts **ask the L-M Field Engineer or write Line Material Company, Milwaukee 1, Wisconsin.**

7124

LINE MATERIAL Pole Line Hardware

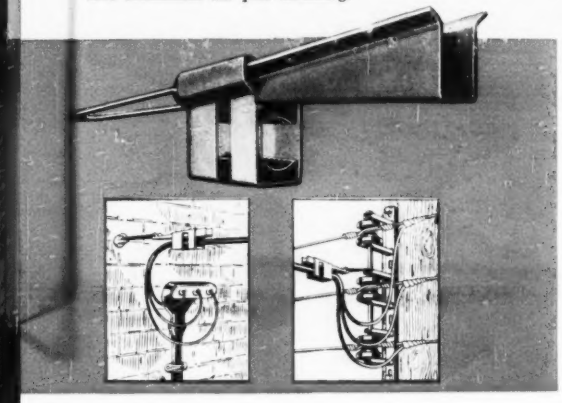
Complete Coordinated Equipment for All Distribution Requirements

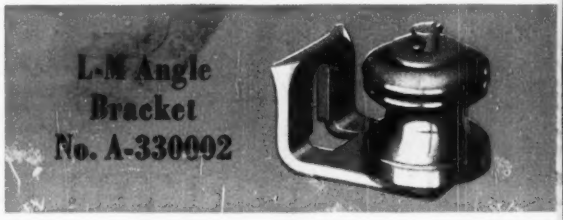
Some L-M Specialties to help you soften up tough jobs



Construction superintendents are always running into tough jobs—and usually manage to handle them successfully. But often these jobs can be handled more easily and quickly with an L-M Pole Line Specialty. There's a wide variety of special clamps, grips, clips, and fittings—this page shows just a few. It will probably be worthwhile to get information on others—perhaps you'll find the "answer to a lineman's prayer." Give it a try, anyway—won't you? Ask the L-M Field Engineer, check your L-M catalog, or tell us your troubles, and let's see if we can't help you lick some of them. **Write Line Material Company, Hardware Division, Milwaukee 1, Wis.**

L-M Take-Off Insulator for Service Drops, No. A-260010—Simplifies installing, replacing, and removing multiple service drops and replacing main secondary conductors, in both old and new construction; may be substituted for secondary racks on pole face opposite main secondary rack conductors. Brown glazed wet process insulator, 4" outside, $1\frac{1}{2}$" hole, set in heavily galvanized steel band; steel yoke; with or without steel pole face attachment for pole mounting.





Heavily galvanized $\frac{3}{8}$" x 3" steel angle bracket, with spur on mounting side to prevent twisting on the pole; $\frac{3}{8}$" insulator pin welded on. Mounting slot is wider in base so bracket can be slipped over bolt head before tightening bolt.

L-M Grip-Tite Service Bracket, Nos. 1870-1874—The greater the pull, the tighter it grips the cable. The wedge-shaped channel does the trick. As the pull increases, the stirrup slides toward the wider part of the channel, clamping the Bakelite jaws tighter together. Bail and hook permit movement with minimum bending of cable. Or bail may be placed directly around through bolt of a rack. Self aligning Bakelite jaws, galvanized stirrup and channel; bronze bail. Two sizes, with channel $6\frac{3}{8}$" and $8\frac{3}{8}$", bail 5" long.

Heavy forged steel eye, No. 1739, $2\frac{3}{8}$" x $2\frac{7}{8}$", for attaching clevis and strain insulator to machine bolt, or for attaching a back guy to double arming bolt. Tapped for $\frac{5}{8}$" bolt unless ordered otherwise. Breaking strength 24,000 pounds. Hot dip galvanized.

Forged steel or malleable iron clevis, Nos. 1741 etc. and 10741 etc.; for attaching strain insulators and back guys to a double arming bolt. Thoroughly galvanized. Several sizes from $1\frac{3}{4}$" to $3\frac{3}{4}$" inside length, tapped for $\frac{5}{8}$" or $\frac{3}{4}$" bolts.

LM

LINE MATERIAL Pole Line Hardware

Complete Coordinated Equipment for all Distribution Requirements

Service-tested designs

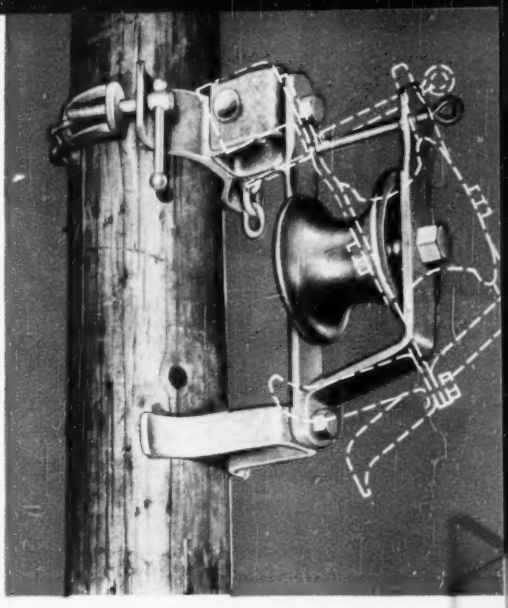
in L-M Self-supporting

Aerial Cable Hardware

Some years ago Line Material adopted the obviously practical policy of testing hardware designs in actual service, to assure the greatest possible serviceability, convenience in use, and protection for the wire or cable.

Aerial Cable Hardware is similarly tested to make sure that it meets the special requirements for stringing and hanging aerial cable. L-M offers many items specially designed for or adapted to aerial cable—a few are shown here.

L-M hardware and specialties are hot dip galvanized under carefully controlled conditions, to assure a uniform, closely bonded coating, with longest practical life for the hardware. For details, information on these and other items, ask the L-M Field Engineer or the nearest L-M branch, or **write Aerial Cable-Hardware Division, Line Material Company, East Stroudsburg, Pennsylvania.**

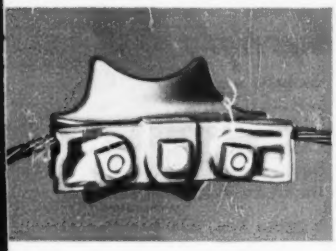


Improved Hinged Stringing Pulley

Used on each pole to facilitate stringing and prevent damage to cable insulation. Pulley frame clamps around pole, at top only, lower yoke acting merely as a support. This permits pulley to swing outward, keeping cable in the groove when it is being pulled at angles in the line.

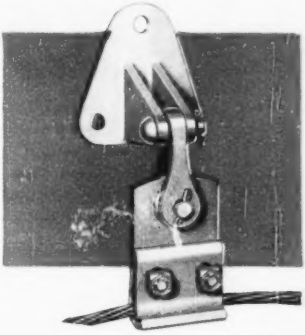
When cable is in place and tensioned, guard pin at top is pulled out, and cable is raised into permanent position in the messenger clamp, usually mounted just above the pulley frame.

This L-M design has been improved to give greater cable clearance and prevent possible damage to binding tape. Sidestraps have been dished, and bolts changed to present smoothest possible surface. Aluminum pulley. All other parts steel, hot dip galvanized.



Malleable Messenger Bracket

Combines an efficient clamp, spacer, and pole plate. Wide base conforms to the pole shape, and will not tilt. Wide flaring lips protect cable on running corners and back angles as well as on tangents. Messenger groove may be above or below the bolts. Securely grips ¼" to ⅜" messenger. The ⅝" or ¾" mounting bolt also acts as third clamping bolt.



Double Swing Suspension Bracket

Heavy formed suspension hanger, giving two-bolt clamping of the messenger with a single hanger that does not require cutting the cable binding tape. May be used on either tangents or angles. Fits messenger from ¼" to ⅜" diameter.

Double Upset Extension Bolt

Provides, in one piece, a mounting bolt, spacer for pole clearance, and extension for mounting clamps; eliminates stocking and field assembly of separate parts. Extra strong hexagonal spacer section provides wrench hold. One-piece forging of mild steel, hot dip galvanized. In ⅝" diameter, lengths from 6" to 18".

Open Side Thimble

Usually attached to pole with oval eye through-bolt. Supports cable at angles up to 60 degrees without cutting or dead-ending the messenger. Full rounded thimble prevents sharp bends or kinks in strand. U-bolt and keeper grip ¼" to ¾" messengers firmly to prevent possibility of slippage. Malleable iron, hot dip galvanized after fabrication.

LINE MATERIAL Pole Line Hardware

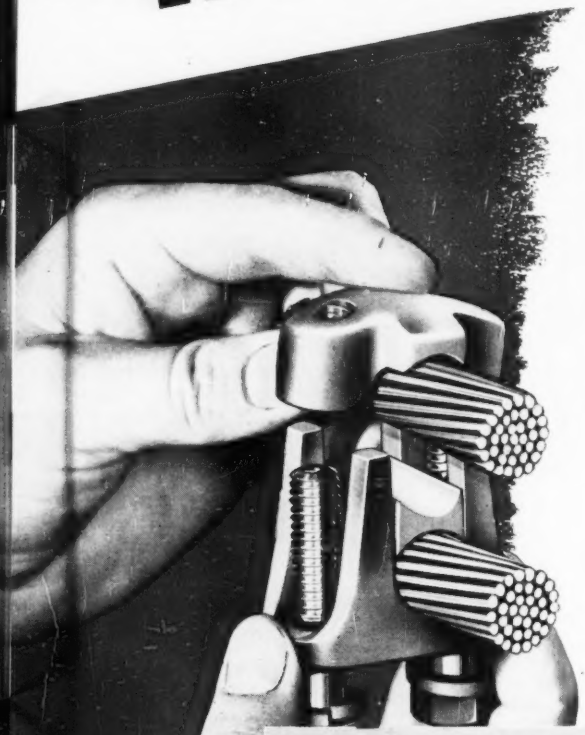
Complete Cordinated Equipment for All Distribution Requirements

IT TAKES LESS THAN

half the torque

TO TIGHTEN THIS

new KYLE type HD two-bolt HEAVY DUTY CONNECTOR



Here's an ideal connector for heavy stranded wire from 4/0 to 1000 MCM. It's easy on cable; gives a firm, low-resistance connection that stays cool; bolts won't drop out; it's easy to tighten, and it just won't come loose!

The tightening force is applied by two bolts which accommodate the standard lineman's wrench instead of the large wrench required for split bolt connectors of the same size. As the table below shows, tightening torque required is quite low—which linemen will like—and which, along with the copper spacer bar, prevents crushing and distortion of strands.

and it stays tight!

A unique feature is that, as bolts are tightened, the tension causes a slight deformation in the bronze cap which locks the bolts tightly in place. Vibration won't—can't—loosen them! Yet the cap springs back to its original shape when the bolts are loosened, so this locking action does not affect the re-use of the connector.

See how easy it is to tighten Kyle "HD's"!

SIZES Stranded Wire	RECOMMENDED TIGHTENING TORQUE	
	Per bolt, for type HD connectors	For split bolt connectors
4/0	240 inch-pounds	750 inch-pounds
350 MCM	300	800
500 MCM	360	850
750 MCM	540	1200
1000 MCM	600	1400

Picture shows the 350 MCM size of the new Kyle HD Connector. Body and cap are red brass; spacer bar is copper; and bolts are silicon bronze. Also furnished zinc-plated for conductors other than copper. The connector is designed so as to give a tight, low resistance connection without distortion of the strands. Nicely rounded body makes it easy to do a good tape job. It's easy to tighten, and has many other advantages over split bolt connectors—yet it costs even less. It's a good job—and a good buy for you! Try it!

For samples and prices ask the L-M Field Engineer, or wire or write

KYLE COMPANY division of Line Material Company

Box 2077, Milwaukee 1, Wisconsin

7122

KC LM

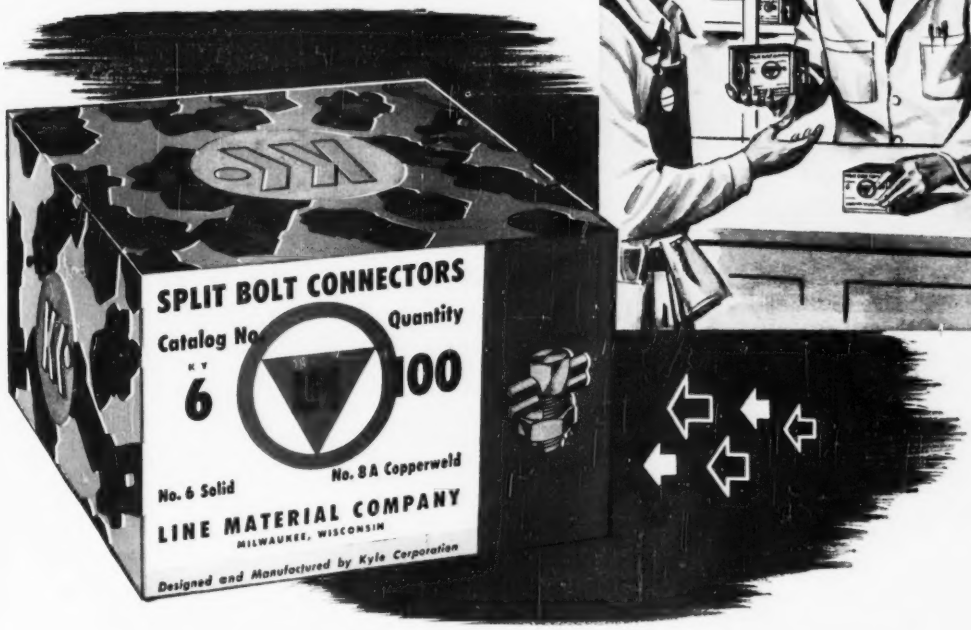
LINE MATERIAL Kyle Connectors

Complete Coordinated Equipment For All Distribution Requirements

YOU CAN TELL INSTANTLY:

Wire Size: A different color for each size from No. 8 solid to No. 1000 MCM.

Characteristics: Code symbol quickly identifies whether connector is Standard, Nut Retainer, Plated, Long, Plated with Washers or with Spacer.



A NEW KYLE FIRST...the connector package that says... *"HERE IT IS!"*

Each LM Connector Package Fully Identifies Contents as to...Size...Characteristics...Wire Type.

Line Material Split-Bolt Connectors . . . in styles and sizes for every type of electrical connection . . . now come to you in a handsomely styled package so plainly marked as to take all the confusion out of stockkeeping.

Each package is plainly marked *on both ends* with a picture of the connector it contains, its characteristics and the sizes and types of wire for which it is designed. Each type and size of connector is designated by separate and distinctive color which adds to the convenience of selection.

For many years the industry has enjoyed such features of Line Material Split-Bolt Connectors as accurate machine-cut threads with no sharp edges . . . the high strength, free-running nut . . . the close-fitting pad with its rounded bearing surface . . . the ample open-end bevel for easy assembly . . . their clear markings for easy identification on the job.

NOW . . . add to this a packaging system of simple, positive, easy-to-understand markings to save time, eliminate waste and simplify stock taking . . . and these Kyle-made LM Split-Bolt Connectors offer service both in the field and in the stockroom that is outstanding.

Your Line Material Representative will be glad to give you full information on Line Material Split-Bolt Connectors to best meet your special line problems.

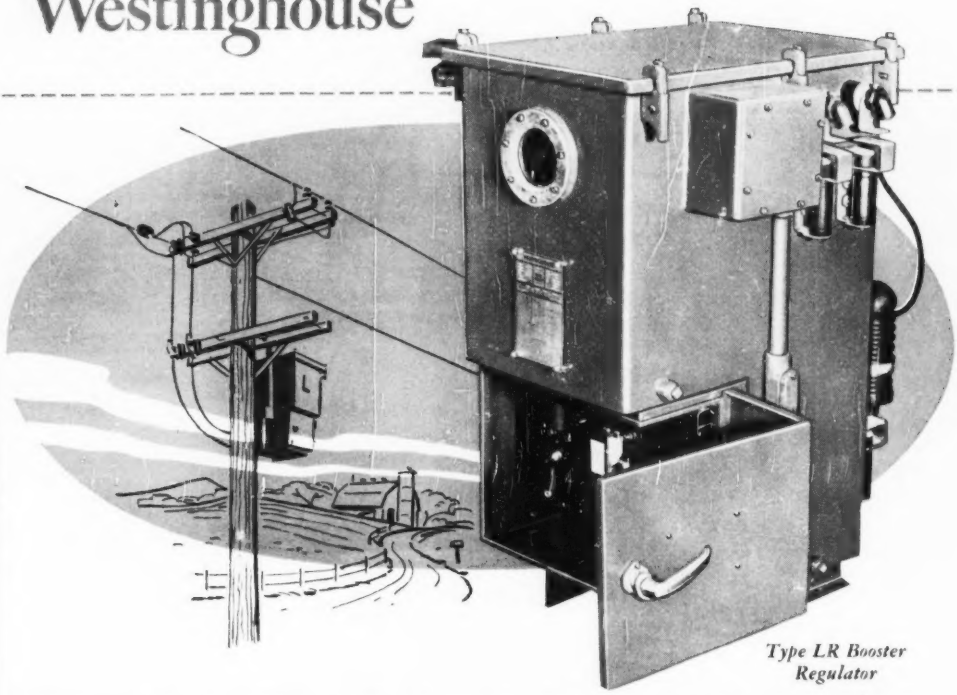
KYLE COMPANY division of Line Material Company
Box 2077, Milwaukee 1, Wisconsin

LINE MATERIAL Kyle Connectors

Complete Coordinated Equipment For All Distribution Requirements

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Type LR Booster Regulator

"Booster Regulators Eliminated 500 Customer Complaints Annually!"

This statement from a midwestern utility superintendent is backed by his own records. They prove Westinghouse Booster Regulators pay their way with customer satisfaction.

"Greatly increased load on our rural lines created serious voltage problems. Customers complained of burned-out motors, dimmed lights and late dinners. The installation of Westinghouse Booster Regulators eliminated these complaints and *substantially increased our revenue.*"

Types LR and BR Booster Regulators are compact, pole-mounted units. They provide reliable voltage control for rural lines. *Their investment costs, as compared with other methods, are slashed as much as 95%!* Installation is quick and easy. Maintenance is negligible.

For complete information about *every* voltage regulation need, call your nearest Westinghouse office, or write for C. S. 47-225, 47-230, B-4245 and Distribution Digest 50-000. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70530

Westinghouse Voltage Regulators

FOR ANY SYSTEM

An

UNBEATABLE COMBINATION

WESTERN RED CEDAR POLES

plus

LIFE-SPAN Treatment

Western Red Cedar full length. LIFE-SPAN treated without creosote. Class two, 60' poles set in 1942.

NATURE builds all Western Red Cedar Poles on the same plan and with the same kinds of fibers, producing wood of remarkable lightness, straightness, durability and strength.

The LIFE-SPAN treatment prevents sapwood decay, gives permanence where cross arms, braces, guys, etc. are attached; gives secure footing to linemen, and maintains the same good public relations of the companies using Western Red Cedar Poles.

Yes, here is truly an unbeatable combination! Western Red Cedar Poles treated the LIFE-SPAN way. They're clean from end to end, safe and easy to handle. Conspicuous by its absence is the creosote butt treatment, heretofore considered necessary. Doubly treated with both a hot and a cold pentachlorophenol solution, LIFE-SPAN Poles mean dependable service up to pole line obsolescence. They're always clean and dry. No oily surfaces that can be transmitted onto clothes of passers-by; no chemical available that can injure livestock.

To be sure, to be doubly safe... specify LIFE-SPAN Western Red Cedar Poles.

This same LIFE-SPAN treatment is also available for Fir, Western Larch and Lodgepole Pine.

Sold only by the following:

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for
Joslyn Mfg. & Supply Co.

NAUGLE POLE & TIE CORP.
Chicago, Illinois

PAGE & HILL, INC.
Minneapolis, Minnesota
50 Church Street
New York, N. Y.

B. J. CARNEY & CO.
Spokane — Minneapolis

CONSOLIDATED TREATING CO.

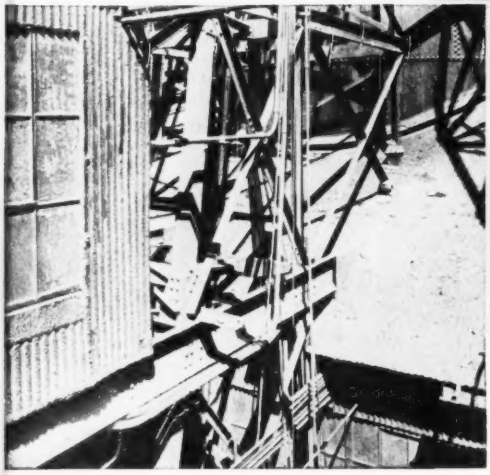
MINNEAPOLIS **MINNESOTA**

More than 4300 pounds of Everdur Electrical Conduit are required to carry power lines to operating machinery at the huge Columbia lime kilns at Barberton, Ohio. Conduit for this installation was supplied by the Hardware & Supply Co., Anaconda distributors of Akron, Ohio.

In operating limestone kilns...

EVERDUR CONDUIT

fights corrosion, gives superior service



AT THE BARBERTON, OHIO, limestone kilns of the Columbia Chemical Division of the Pittsburgh Plate Glass Company, corrosion is an ever-present enemy of the power lines that feed the operating machinery.

After failure of various other types of conduit, the Purchasing Engineer specified Everdur* Rigid Conduit. He reports, "We are satisfied that Everdur Conduit is a long-run economy and the solution to this particular problem."

Everdur Copper-Silicon Alloy Conduit possesses high strength, is non-magnetic, workable and weldable. It is available in two wall thicknesses; rigid conduit (RC) in nominal sizes from ¼" to 4" inclusive, and the thinner-walled electrical metallic tubing (EMT) in nominal sizes ⅜" to 2" inclusive. Complete lines of fittings...connectors, couplings, outlet boxes, etc.... are available in Everdur Alloys from leading manufacturers.

*Reg. U.S. Pat. Off.

ANACONDA

Everdur

ELECTRICAL CONDUIT

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

You'll Save . . .

You'll Get Faster Deliveries with *Pennsylvania*

STANDARD PARTS POWER TRANSFORMERS

Available in the following sizes:

Three Phase: Up to 10,000 Kva, 34 Kv
Single Phase: Up to 5,000 Kva, 34 Kv

This new line of Pennsylvania Power Transformers was designed to include the desirable features of custom-built transformers, at quantity production prices. Streamlined and standardized methods of manufacture, coupled with the use of standard designs and standard parts, shorten engineering and production time. This reduces the price of the transformer and shortens the delivery time.

Standard Parts Transformers can be supplied with any method of oil preservation.

Auxiliary tanks, welded to each end of the transformer and connected to each other and to the main tank, form the following oil preservation systems:

Inert Gas-Oil Seal

Sealed Tank

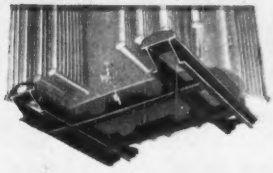
Inert Gas Pressure System

Oil expansion tank can be provided instead of auxiliary tanks.

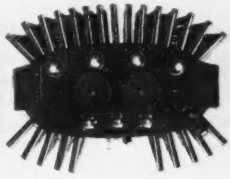
Auxiliary tanks, in most cases, do not add to the projected floor area.

The Sealed Tank and Inert Gas Pressure Systems can be changed, in the field, to Inert Gas-Oil Seal, without difficulty and without changing any parts. Inert Gas Pressure System can also be changed to Sealed Tank.

Transformers can be provided with Throats, and with Compartments for switchgear, etc.



Base for Standard Parts Transformer. Base is designed to simplify jacking, pulling, rolling, and painting.



Top of 4000 Kva Standard Parts Transformer. Note how auxiliary tanks fit into ends of the transformer and do not add to the length of the transformer.

Standard Parts Power Transformer. 3750 Kva, 3 Phase, 60 Cycles, OA, 55°C. Voltage: 12,000 Delta-4,160 Y.

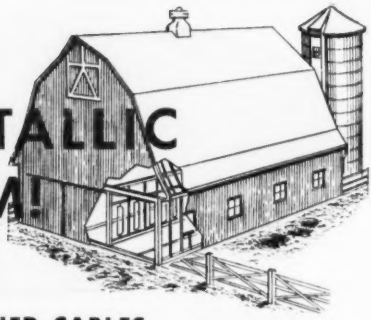
Pennsylvania TRANSFORMERS

For further information, write for Booklet No. 1492

Pennsylvania
TRANSFORMER COMPANY
PITTSBURGH 12, PENNSYLVANIA

NATIONAL ELECTRIC has the *COMPLETE* NON-METALLIC FARM-WIRING SYSTEM!

All listed by UNDERWRITERS' LABORATORIES, INC.



NON-METALLIC SHEATHED CABLES

CANVAS-BACK LOOMWIRE

FOR DRY LOCATIONS—NORMAL REQUIREMENTS

Moisture and Flame Resistant. Smooth, Slick Easy Working

A new, smaller diameter cable. **"Canvas-Back"** Loomwire is the most economical system for farm wiring. Ideally suited for all types of wiring not subject to undue moisture, drastic changes in atmospheric conditions or severe usage. Available with Type R or Type T conductors.

NE-O-PRENE LOOMWIRE

DESIGNED FOR WET LOCATIONS—SEVERE USAGE

SEALS OUT: Fumes, Flame, Moisture, Oil and Grease

RESISTS: Rot, Acid, Fungus, Mechanical Abuse

Ideal for barns, stables, milk houses, hatcheries, and other locations where moisture, ice, ammonia-laden air, rot, fungus and drastic weather changes are destructive to other approved types of wiring.

NON-METALLIC UNDERGROUND CABLE

FLEXLAY CABLES

FOR UNDERGROUND SERVICE—ELIMINATES OVERHEAD LINE HAZARDS

RESISTS: Abrasion, Water, Grease, Oil, Soil Acids

WITHSTANDS: Flexing, Kinking

Type USE, Style RR, **"Flexlay"** Cables provide the most economical, permanent underground electric service installation. The direct burial of **"Flexlay"** in the ground eliminates overhead wires from power line to meter and to the various farm buildings.

PLUS WIRING SYSTEM ACCESSORIES for all Farm Wiring Jobs:

"REDEGE"	"EZ"	"EZ"
Outlet and device boxes	Box Connectors	Cable Ripper

You are *always safe* when you recommend National Electric Wiring Systems. Sold through leading electrical wholesalers. *Write* for the new Farm Wiring Catalog *Today.*

NATIONAL ELECTRIC PRODUCTS — WIRING SYSTEMS — WIRES AND CABLES

National Electric Products Corporation

1305 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

Americanism

"So we decided to do something about it," says Dr. Adam S. Bennion, vice-president of the Utah Power & Light Co. Dr. Bennion was referring to his company's program for perpetuating the American way. Utah Power & Light Co has done something about it, as the record of accomplishment adequately shows. In summary here is the approach they took.

"We first launched sixteen dinner meetings for employees and their wives. At those dinners we sat down with 2,400 men and women. First of all we explained the purpose of the meeting; then we discussed the principles underlying the American Republic. This we did through a presentation of the historic Freedom Train documents . . . Second, we presented one of the outstanding films yet to be produced on the principles of American freedom, 'Of This We Are Proud,' put out by the Nash-Kelvinator Co. Third, we made application of the documents and the film to the electric power business. This discussion centered in the achievements to date of the electrical industry, the threats of federal valley authorities, the folly of competition between the government and its own citizens, and finally a program of suggested cooperation."

This program took the conciliatory and cooperative approach that would be expected from honorable men. They suggested that electric co-ops and the private power companies join hands in a common purpose to sustain each other and offer complete coverage to every home in the nation. Carrying this idea further, they told employees that; "the same kind of cooperation can be carried into the relationship between the federal government in its harnessing of the great rivers of the land and in the building up of the private power companies." Undoubtedly they included municipal utilities in the same cooperative spirit.

The program was so successful that material was requested by service clubs, literary clubs, churches, and schools. Dr. Bennion says, "Our records show that through the documents and the film we have reached almost complete coverage in our territory . . . A conservative estimate indicates that we have met directly more than 62,000 people in the State of Utah and many other thousands in neighboring states."

The program did not stop with dinner meetings. It was incorporated in the formen's conference program including 255 supervisors divided into 17 conference groups. They held monthly conferences on the subject, discussing the critical public issues.

Here we see the pattern for others to follow. Here we find leaders who didn't wait until the financing, construction program, rate change, or sales problems had been disposed of. They went ahead as their consciences guided, pioneering in this fundamental of good human relations.

With applied electric power as one of the basic foundations for America's high living standards, who else can so forcefully present the story?

The utilities are the natural leaders in teaching "Americanism at the grassroots."

Better Liaison in TVA

WE LEARN from a Scripps-Howard piece out of Washington that TVA has invested some of the funds of its independent employee retirement fund in the securities of electric utilities.

That makes us think back to a provision of the TVA Act. It stipulates that no director of TVA "shall have financial interest in any public utility corporation engaged in the business of distributing and selling power to the public. . ."

We're uncertain as to whether TVA directors are covered by TVA's retirement fund, but it's appalling to think of the consequences if they are. Why, the man who's covered by TVA's retirement fund certainly has a financial interest in it. And the fund apparently has a financial interest of major proportions in the private power business of these United States. The resulting interest of the covered employees in the financial structures of operating electric companies may not be direct, but if those securities were to turn sour, the interest certainly would be persuasive. What's to be done about this, men?

We don't know, frankly, what's to be done. On the logic of some recent federal decisions regarding the power business we could expect an order to issue forthwith directing that those electric companies in which TVA's retirement fund has an interest should get out of the power business immediately and stop confusing TVA's portfolio manager. We might even anticipate an indictment of these companies for inducing TVA's directors to violate the law that says they shall have no financial interest in a power company. These companies didn't have to sell securities, did they?

Seriously, though, there's one thing about all this that strikes us as being noteworthy. Just look at the location of the companies in whose securities TVA has invested. Cleveland, Chicago, New York, Jackson, Detroit, Beaumont, Minneapolis, Canton, Philadelphia, Washington, Newark, Los Angeles, St. Louis, and Houston. In every case except one it looks as if TVA's portfolio manager has been careful indeed to buy securities that were not prospectively endangered by TVA's expansion. But how in the world did St. Louis get in there? Does this mean the investment fund man at Knoxville just slipped up, or hadn't he been told about New Johnsonville? Looks like TVA's front office ought to keep the boys informed down the line.

What Losses are Worth

AS LONG as losses account for 15 to 20% of generated energy that never reaches the paying customers there is one good place to achieve some economy to thwart high cost. But the task is not so simple as to whack off 5% somewhere or everywhere and bring 15% down to 10%. The trouble is that conductors, magnetic material, and insulation are inescapable and present inescapable wastes of energy in one way or another.

In fact, the most that can be done is to shuffle the amounts, disposition, and quality of copper, iron, and, say, paper so that the sum total of frittered energy is the smallest possible. Nor would this be a difficult task for a system engineer to achieve by himself if he did not encounter the proportions of losses "precanned" in the equipment he buys for the system.

That circumstance shifts part of the responsibility and the opportunity back on the manufacturer, who, of course, does the "pre-canning" in the light of his experience, intelligence, and response to the common-denominator wishes of his customers. Unfortunately the term common-denominator is a complete misnomer because the utility engineers and economists are not at all agreed on the method of assigning a value to losses. Until there is such agreement on standardization, the industry can hardly expect the manufacturers to design their apparatus for most economic efficiency. It usually costs more to make something more efficient. But how much more is warranted to make it how much more efficient?

The answer to that rests with the utilities and it will not be resolved until there is agreement on this basic issue—is a wasted kilowatthour to be evaluated only at its fuel-consumed value or does it carry its own "demand charge" in the form of a prorated assessment for the investment charges on the facilities devoted at the time to generate the corresponding kilowatt? The difference can be 3 to 1, so the disagreement is surely costing the utility industry too much somewhere—either for super-efficient equipment or for super-wasteful equipment. Why can't that loss be resolved by agreeing on the method of valuing a kilowatthour en route?

Brushes are Collectrodes

IN THE early days of the electrical art the d-c machines had copper brushes making contact with the copper commutator segments. It was reasonably logical to call them brushes because the bundle of copper wires or sheets of wire gauze had some resemblance to the bristles or whisks of a brush or broom.

But the switch to carbon as a "brush" material less guilty of commutator sparking removed the excuse but not the habit of calling the contact device a brush. The habit has been so confirmed that it would take a few years to induce an alternative designation.

Anode, cathode, electrode, diode are all familiar terms so why could not brushes join the "ode" family and become collectrodes? Latin *collecta* (a gathering) joins with the Greek *hodos* (the way) to indicate that electrons are assembled from the generator and sent on their way. Purists, of course, will object that the reverse may be taking place in a motor. Well the purists need only look the other way to be satisfied.

The Electrical Week

It took a long time to get a decision, but the Supreme Court said SEC was right as rain when it allowed a call premium to Engineers PSCO preferred stockholders. The decision is expected to mitigate what had promised to be extensive litigation on other pending cases under the Holding Company Act . . . From the opposite end of the country came some pre-July 4 fireworks. Tacoma Utilities Commissioner C. A. Erdahl blistered the Interior Department for interfering with the city's ability and right to care for its own power needs . . . Back East, in Swampscott, Mass., the AIEE installed its new president, J. F. Fairman, and heard speakers stress the responsibility of engineers to society . . . And in Cincinnati, PUAA members spent their annual convention discussing techniques, rather than policies . . . Back in the Northwest, a break came in the off-again-on-again negotiations over sale of Puget Sound Power & Light. The company and Snohomish PUD have agreed on sale of assets valued at $16 million.

New York State's Appellate Division says the state Public Service Commission went too far in ordering that $21.5 million rate cut for Consolidated Edison. The company thus won the next round of the battle over depreciation accounting. But an appeal is possible.

The U. S. Bureau of Standards has been asked to prepare a report for Congress on the status of color television. Retailers and manufacturers hope it will help stabilize TV sales by letting the public know exactly what goes on in this controversial field.

No hope for expanding the Wage-Hour Act to cover more workers; little, if any, chance for increasing the minimum wage this year. That's the way Congressional leaders now look at the President's call for higher minimum pay for more people. After the refusal of his House Labor Committee to approve a simple boost in the minimum wage from 40 to 75 cents, Chairman Lesinski said he would try again. But he's not cheerful about the prospects.

Australia plans to build 16 underground power stations in remote mountain areas to produce power for secret defense research and for new industries.

In Wisconsin, where natural gas is to be available soon, a utility company is busy getting Wisconsin municipalities to repeal ordinances barring its use. The solid fuels lobby had them passed years ago.

Already apathetic toward the President's proposed Columbia Valley Administration, members of the House Public Works Committee now are hopping over Administration tactics on the measure. They say the committee was told to stage CVA hearings promptly or expect trouble with its own pet projects, such as rivers and harbors and flood control legislation. Administration Congressmen, through control of the Rules Committee and the House leadership, could stall flood control bills, for example. After that, the President could veto them.

You can give your workers a day off to celebrate defeat of a union in a bargaining election but paying them for the holiday is going too far in the eyes of NLRB.

TV merchandising in New York is really getting rugged. Competing ads in the New York Times of June 23 showed it is possible to buy a small set for $99.95—$90 under the original price—take it across the street and trade it in on a big receiver for $135, an allowance $35.05 higher than the price you paid for the small set.

CIO President Philip Murray will recommend to the CIO convention Oct 31 that affiliates like the United Electrical Workers be barred from representation on the executive board for failing to comply with convention policies.

In a recent booklet, Dallas Power & Light Co estimated the operating costs of 87 electrical appliances. Some uncommon ones were a corn popper, hedge clipper, insect trap, organ, and soldering iron.

A new gimmick in "fringe" benefits has been won by AFL soft drink workers in Trenton. They get their birthday off, with pay.

Notes From The News

McGraw Electric Co, Elgin, Ill., has acquired control of Line Material Co, Milwaukee. If the stockholders approve, Line Material will be merged into McGraw Electric . . . Edmond M. Hanrahan has been reelected chairman of the Securities and Exchange Commission for the year ending June 30, 1950 . . . The old steam-electric generating plant of Danville, Va., is being readied for production in accordance with a city council decision not to contract with the Appalachian Electric Power Co for stand-by service.

Continued on following page

BEGINNING of a television cathode ray tube is this lump of glass on which a glassblower of Major Television Corp, Bethpage, L. I., is working. Tube production faces a cutback this year

Galion, Ohio, voters will get a chance to pass on an ordinance authorizing Ohio Public Service to serve two industrials there. The Mayor-Council dispute arose because the municipal system was unable to serve the loads . . . A Merrill Lynch, Pierce, Fenner & Beane study concludes that utilities are relatively "depressionproof."

Columbus & Southern Ohio Electric Co employees have voted to accept terms of a proposed contract affecting about 800 workers in the plants, line department, and substations of the Columbus district. The contract offered wages which "meet" the rest of the industry," according to officials of the union (Local 1466, IBEW) . . . Twenty thousand years of active service were represented at the annual field day meeting of the Central New York Power 25-Year Club, composed of men and women with a quarter-century or more of continuous service with the company.

Financial:

American Gas & Electric Co has increased its quarterly common dividend from 50¢ to 75¢. The company also proposes to offer about 500,000 additional common shares about Oct 1 to stockholders on a one-for-nine basis . . . Electric Bond & Share, once the nation's largest utility holding company, has announced it may seek exemption from the Holding Company Act. Completion of its divestment program will leave the company in a position to use funds from the liquidation of domestic utility holdings for "productive new investments." . . . In Guatemala, the Ministry of Finance has ordered Electric Bond & Share's local subsidiary to pay $200,000 as a corporation profit tax. Reportedly the sum will be taken out of dividend funds.

Dayton Power & Light will issue 283,333 shares of additional common to its stockholders on the basis of one new share for each share held as of July 6. Proceeds will finance part of a proposed $40-million construction program for 1950 to 1952 and will retire $5 million of short-term bank loans . . . Union Securities Corp has been chosen by American Power & Light Co and Kansas Gas & Electric Co to form a banking syndicate to negotiate for the purchase and reoffering of 550,000 common shares of the latter. Of the shares 450,000 constitute the remaining holdings of American P&L and the rest are to be sold by Kansas G&E to pay for its construction program . . . Kentucky utilities are being assessed a total of $100,000 to support the PSC during the coming fiscal year.

Construction:

Potomac Edison hopes to beat its December deadline for operation of its new Riverton steam plant . . . Savannah Electric & Power Co is completing its Riverside plant for operation next February . . . Appalachian Electric Power has programmed an $800,000 expansion of its facilities in and near Lynchburg, Va.

Ontario Hydro is ready to proceed with a 450,000 to 500,000-hp addition to its Queenston plant . . . Montaup Electric Co has begun construction of a 60,000-kw plant . . . Maj. Gen. Lewis Pick, chief of Army Engineers, says the Corps now has on paper a national flood control program consisting of almost 1,000 projects, whose estimated cost is $7,500,000,000 . . . Appalachian Electric Power has begun land acquisition for a large new steam plant near Charleston, W. Va.

Contract for construction of the Philpott Dam across the Smith River has been awarded to a three-company combination which bid $6,493,526. The flood control and power project is scheduled for completion by Apr 1, 1952 . . . Southwest Rural Electric Association, Tipton, Okla., will spend about $27,000 to build a substation on the 66,000-v Public Service Co line southeast of Altus.

Construction has begun on a new Northwest Electric Cooperative power plant at Woodward, Okla. It is expected to be completed in four months' time. The building has an estimated valuation of $100,000, with the equipment estimates running to about $400,000 . . . Additional equipment doubling the capacity of the Ohio Power Co's Licking View substation has been put into operation. Cost of the project was $75,000.

Preferred Is Good Money-Raiser

Electric Utilities Raise 80% of 1949 Preferred Stock New Money Target In Less Than Six Months; Sales Record Even Surpasses That Set by Common

ELECTRIC UTILITY management has been finding preferred stock a star money-raiser during the second quarter of the year, an ELECTRICAL WORLD survey showed this week.

Relatively, the capital expansion possibilities through new preferred issues during the past three months have been better than those of new common stock issues—and new utility common issues have been booming all year long.

Was the Goal Too Low?

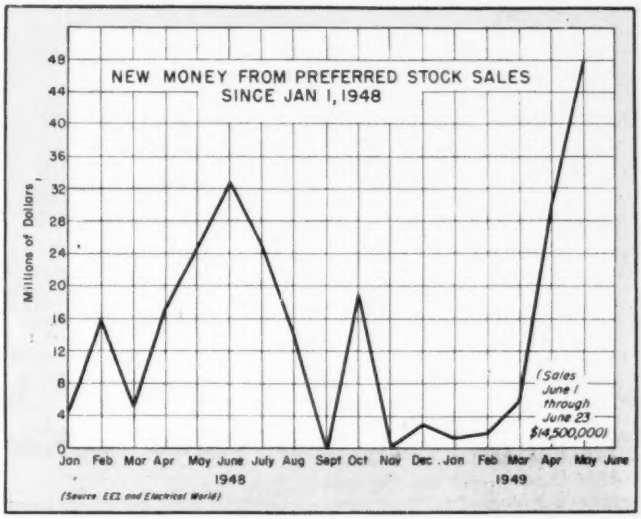
Statistically, the power business is in excellent shape to surpass its year's quota of new money raised from preferred stock sales. An ELECTRICAL WORLD survey late last year showed that the industry figured on raising $128.4 million in 1949 from the sale of new preferred. With more than a week remaining in June, it already had raised $102,049,000 of new funds from this source. That's 80% of the target in 50% of the time. Another $7.3 million was registered or planned for sale. Excellently as the industry has been doing on common stock sales this year, the preferred record is much better—statistically.

Trouble is, according to a number of experts, that the returns which comprised the ELECTRICAL WORLD survey figure on prospective preferred sales probably are no longer realistic, in view of the turnabout that has taken place in the utility preferred market.

Disliked Sinking Funds

"Utility preferreds were dogs last November," one expert asserted. "The yield had dropped to levels that drove both institutional and private investors out of the market. Preferreds had been sold at very low yields to institutions which promptly saw the stock go off half a dozen points or more. That led the institutional investors to demand sinking funds. The imposition of the sinking fund drove many utilities out of the preferred stock market promptly. Utility presidents felt that equity financing should be permanent financing—and there's nothing permanent about an issue that sells with a 40 to 50-year sinking fund. That merely makes companies raise the money twice—and at a time when it's hard enough to raise it once."

It was on such a basis that experts agreed the $128.4 million target probably was a realistic one last December. But the very fact that, only three months later, the market could have revived so much that three fifths of the goal could be raised in 60 days—$78 million from new preferred sales in April and May—hints that the preferred pessimism of December had been reversed by June.



One of the reasons for this reversal—perhaps the biggest—is to be found by a glance at the yields that obtained then and those that can be had now. Preferred yields, at the date of initial sale, touched their postwar low when Iowa Power & Light sold an issue at 3.25% in February, 1946. By contrast, only two weeks ago the Staten Island issue moved smoothly at 4.75% to the public. Southwestern Gas & Electric breezed along at 4.57% and New York State Electric & Gas went for 4.42%.

Much as the sellers would like to retain the yields of two years or more ago, they seem to be more concerned today with getting the money. As a result, experts point out, preferreds are getting back to the point where they're pretty attractive on a yield basis.

Another reason for the revival of the preferred market is traced to the drying up of other placement possibilities for institutional investors. Mortgages are fewer this year. The business slide has cut down on institutional loans. Each of these facts has added to the pressure for getting institutional funds to work—and at good yields. And with the rise in yields, the institutionals are less insistent on sinking funds than they were.

Forecasts for the remainder of the year are tied to the trend in yields. The experts figure that if the yields remain attractive, the market will too. One estimated that the average of new preferred money per month that has been maintained so far this year can be maintained for the rest of the year if the yields are right. The feeling is that the July-August slump in new financing will be distinctly less noticeable in the preferred market than in the common stock field. Senior securities generally feel the vacation season less than juniors. Maybe it's because institutional investors don't take vacations, whereas people who buy stock under rights often do.

And the belief is that there probably are a lot of utility men eager to sell preferred stock today who wouldn't have expected six months ago that they'd be selling any this year. The way the issues have been pouring in indicates this.

SKELTONS WERE PROMINENT at the recent dedication of the Skelton Station of Central Maine Power Co on the Saco River. Left to right are John K. Skelton, grandson of William B. Skelton, chairman of the company for whom the plant was named; Janice Skelton, who unveiled the plaque; her great-grandfather, Chairman Skelton; and William F. Wyman, president of the utility. The 16,800-kw plant replaces a 650-kw installation

High Court Eases Litigation Threat Through Engineers PS Co Decision

THE SUPREME Court this week gave the Securities & Exchange Commission virtually unlimited discretion in disposing of assets of firms reorganized under the Public Utility Holding Company Act of 1935.

The Court's clear-cut, 7-0 decision in a dispute between preferred and common stockholders of Engineers Public Service Co unqualifiedly approved SEC's security evaluation practices in Section 11 (e) reorganizations. It also limited the area of review by the courts of 11 (e) reorganization programs.

The Supreme Court ruling thus punches a hole in the cloud of prospective litigation shrouding practically all major Section 11 (e) reorganizations before the Commission. Numerous objections of stockholders to 11 (e) plans still will get into the courts, but the ground rules for settling such legal tangles are spelled out in the 18,000-word decision of the Supreme Court. On the other hand, a reversal of SEC's valuation formula almost certainly would have involved the Commission in stockholders' suits to review practically all its 11 (e) orders.

The Supreme Court upset rulings of two lower courts to award preferred stockholders of Engineers the call prices of their shares. Common stockholders had sued to limit the preferred payment to the involuntary liquidation price. The total difference involved for the three classes of preferred amounted to a total of $4 million, including interest.

A federal district court and circuit court of appeals agreed with the common stockholders that SEC should consider numerous other factors in evaluating the Engineers' preferred. All these were specifically ruled out by the Supreme Court in sustaining the Commission's findings as legally adequate and equitable to all security holders.

The proceeding arose out of an SEC order directing Engineers to change its dissolution plans to allow the call price for the preferred. The company originally proposed to pay such stockholders the involuntary liquidation price of $100 per share. The call price provided in the preferred charter was $105 per share for a $5 series and $110 per share for $5.50 and $6 series.

When common stockholders protested, SEC directed Engineers to make payment of $100 per share for the preferred and to set up an escrow fund to secure the additional payments during litigation. This brought a protest from a group of preferred stockholders, who objected to the termination of their dividends during the litigation.

Dealing first with the review powers of the federal district court, the Supreme Court held that SEC's valuation findings, "based upon judgment and prediction, as well as upon facts," were not subject to reexamination unless they were "not supported by substantial evidence or were not arrived at in accordance with legal standards." The field of valuation, the court added, was an area in which Congress gave SEC "authority to develop rules based on its expert knowledge and experience" and to make "policy decisions." Thus, the lower courts erred in reviewing "matters committed to the Commission's discretion and expert judgment not involving questions of law" and in setting up "a different standard" than that used by SEC in evaluating the Engineers' preferred.

The court also passed upon the validity of SEC's valuation of Engineers' securities. The Commission complied with its "statutory mandate" in fixing these values by "the investment value the securities would have if it were not for the liquidation required by the (Holding Company) Act." Through its own studies and those of other "experts," SEC concluded that the "going-concern value" of the Engineers' preferred exceeded the call prices. It allocated the call price to the preferred stockholders since that price "marked the limits of the preferreds' claim."

Thus, as in previous cases, the Supreme Court ruled out charter provisions as a basis for settling the value of senior securities. But it insisted that its acceptance of the investment value formula could not "destroy charter or contract right to priority satisfaction." SEC recognized this priority in the Engineers case.

The protest of the preferred shareholders was dismissed on the grounds that the escrow fund gave them full protection to which they were entitled.

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Nebraska Power Supply To Be Normal in August

Pressure on Nebraska sources of power supply, which at times has forced curtailment, will end in August. W. P. Venable, superintendent of power supply for the Consumers Public Power District, told 100 superintendents and department heads in Lincoln.

The Nebraska Public Power system will have 32,000 kw capacity available in August at the new Bellevue steam plant and will double it in September. A new 15,000-kw turbine NPPS is installing at the Lincoln plant, leased from Consumers, will be ready in the fall of 1950. Omaha Public Power District will put its new 20,000-kw turbine in service some time in August and soon will have a connection with Iowa Power & Light at Plattsmouth, Neb.

$500 IS ADDED to the $2,500 scholarship fund previously donated by Chicago Section of the Illuminating Engineering Society to the University of Illinois. Glenn B. Boyd, right, Section chairman, makes the presentation to Prof William L. Everitt, head of the Electrical Engineering Department. At left is Prof John C. Kraehenbuehl, advisor to the University of Illinois Chapter of IES, the first IES student chapter formed

Municipal Power Leader Opposes Interior Move to Control Rivers

A MUNICIPAL power leader is the latest addition to the ranks of those who oppose the Interior Department's move toward jurisdiction over U. S. power rivers.

That was the net, this week, of Tacoma's Utilities Commissioner C. A. Erdahl's statement to a Senate Appropriations Subcommittee. The statement alleged, among other things, that Interior is denying Tacoma's right to take care of its own electric power supply problems.

Erdahl, who asserted the possibility that "the city's support must be withdrawn and in its place there must be violent opposition" to federal development of the Columbia basin's hydroelectric resources, was the second public power figure to line up against Interior on its drive to control the rivers. First was the Federal Power Commission, cited by Erdahl. FPC has been declining Interior's repeated offers to help it adjudicate hydro construction license applications.

Erdahl's statement—which he advanced "with assurance of complete, authentic documentary support if desired"—opened with the flat allegation that "Tacoma's plans for its own generating capacity have been blocked by the interference of federal agencies, chiefly within the Interior Department."

He said he was entering the city's protest "against an attitude which disregards local public and private utility rights within the area served by the Bonneville Power Administration" and added that Tacoma is not the only utility to be affected adversely by "interference of federal agencies."

Erdahl cited three examples of such interference. The first concerned plans his own system had for a dam on the Cowlitz River. He said Interior Secretary Krug and the National Security Resources Board both urged Tacoma and every other non-federal power supplier in the Pacific Northwest last year to install as much capacity as fast as possible to help out the area power supply job. But, he went on, opposition by the Interior Department's Fish and Wildlife Service and by Assistant Interior Secretary Williama E. Warne, helped block that project. Tacoma, he indicated, is angered at this, not only because it has a 56-year record of caring for itself, powerwise, but also because of the undependability of federal power sources in the region.

"On the basis of the situation at present and in the immediate future," Erdahl declared, "the federal Columbia system offers no assurance whatever of either adequacy, reliability, or cost over the coming decade for which Tacoma had planned the Cowlitz."

Inability of the Northwest Power Pool to meet present peak loads, Erdahl went on, is:

". . . a situation which may readily grow more acute at critical water periods in the years ahead; and probably will become a chronic menace to regional economy before there is a solution from the federal system, as has been pointed out, even if all requested appropriations were to be granted by this and succeeding sessions of Congress for the next eight years."

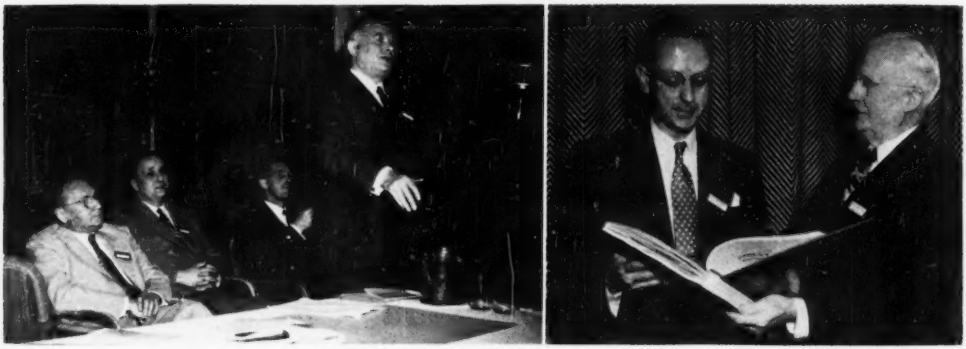
Cites Other Projects

"The situation with regard to the Cowlitz River does not represent the only situation in which federal agencies have interfered with the plans of local agencies, public and private, to meet their own requirements," Erdahl asserted. He cited testimony by a Fish and Wildlife Service official—who had fought the Tacoma Cowlitz proposals after Krug urged all possible non-federal power construction—against a proposal by allied private power companies to build the Pelton project on the Deschutes River, in Oregon. This opposition, Erdahl said, was supported from Washington by Assistant Interior Secretary Warne.

This third example of Interior Department interference with the right of local power suppliers to care for their own needs, Erdahl said, lies in Virginia. There, Interior attempted to intervene in an FPC proceeding on whether Virginia Electric & Power should be licensed to construct a hydro plant on the Roanoke River, for which Congress had authorized an overall development plan, to be carried out by the Army.

"If the Congress should approve the 308 Review Report (an Army Columbia River development plan similar to that for the Roanoke River) and such approval should be considered as authorization for the projects as described and listed in that report, then the city of Tacoma would be faced by the same situation as now exists on the Roanoke River, where the Secretary of Interior could maintain that approval of the nine projects on the Cowlitz, described by the War Department, preempts the construction of all these projects for the federal government in opposition to construction by any local agency and in disregard of the rights of any such agency.

"The city of Tacoma contends that the prejudicial and preemptive actions of the Department of the Interior and the War Department have been and will continue to be damaging to the power supply, and hence to the entire economy of the City of Tacoma in particular, and the entire Pacific Northwest in general, for so long as the federal program falls short of meeting the area's requirements."



PRESENTATION of the Lamme Medal by the American Institute of Electrical Engineers was a feature of the Institute's Summer General Meeting last week at Swampscott, Mass. Here Brig Gen David Sarnoff, Board Chairman of RCA, reviews the career of the medalist. At left is the medalist, RCA Vice-President V. K. Zworykin. Between him and Sarnoff are N. S. Hibshman, dean, School of Science and Technology, Pratt Institute, and retiring AIEE President Everett S. Lee. Picture to the right shows incoming AIEE President J. F. Fairman, left, examining a bound volume of congratulatory messages sent him by officers of the National Society of Professional Engineers and state affiliates. On the right is W. F. Ryan, engineering manager for Stone and Webster Engineering Corp. Ryan made the presentation.

Engineer's Responsibility to Society Stressed at AIEE Summer Meeting

TECHNICAL EDUCATION today is not orienting the student engineer to the community and civilization of which he is a part.

This charge was laid before 1,500 engineers who attended the Summer General Meeting of the American Institute of Electrical Engineers last week at Swampscott, Mass., by W. F. Ryan, engineering manager of Stone and Webster Engineering Corp.

Ryan struck out sharply against what he called "fragmentation of the profession" into mechanical, electrical, civil, and chemical engineering groups in the colleges at the very beginning of their professional careers.

"As the horizons of our civilization expand," Ryan said, "the task of engineering education becomes one of integration, not diversification. The engineer must be given broader education for his professional and ethical responsibilities."

During the general session at which Ryan spoke, Dr Valdimir K. Zworykin, vice-president and technical consultant of the RCA Laboratories Division, was awarded the Lamme Medal "for his outstanding contribution to the concept and design of electronic apparatus basic to modern television." The award, established in 1928 through a bequest of Benjamin Garver Lamme, chief engineer of the Westinghouse Electric & Manufacturing Co, was presented by Everett S. Lee, president of AIEE. N. S. Hibshman, Dean of the School of Science and Technology, Pratt Institute, and chairman of the Lamme Medal Committee, reviewed the history of the award. Brig General David Sarnoff, chairman of the board of RCA, described the career of the medalist, hailing Dr Zworykin as the "scientist extraordinary of this age."

Everett S. Lee, who retires as president of AIEE this summer, told the institute in his farewell address that engineers must devote more time to living with their fellow men. "The man on the street has come to think of engineers as men apart," Lee said.

The engineer must exercise his peculiar abilities in the general fields of education, civic affairs, and religious groups so that his fellow citizens will know him better and learn from the engineer himself of the profession's contributions to the community. Engineers must learn to mix their services in engineering and civic life in proper proportions, Lee asserted.

Continuing the accent by non-technical speakers on the problems and implications of engineering education, Dr James P. Killian, president of MIT, addressing the banquet Wednesday evening, warned that it will cost engineering colleges $12 billion to bring their facilities up to prewar standards. By 1960, he said, college enrollment may reach 4,600,000, or double what it is today. Dr Killian pointed out that not all these students are equipped or qualified to "go to college." To relieve the pressure for higher education without lowering academic standards he suggested the formation of community colleges—possibly under government subsidy—where students could receive two years of liberalizing education and technician training. However, Dr Killian did not believe that government subsidy should be extended to institutions of higher education.

James F. Fairman, vice-president, Consolidated Edison Co of New York, Inc, was elected president of AIEE for the year beginning August 1, 1949, at the annual meeting of the Institute. In accepting the office, Fairman pledged himself to a program of advancing inter-society relations and promoting unity of the engineering profession. Following his inauguration President Fairman was presented with a book containing messages of congratulation and good wishes from all the officers of the National Society of Professional Engineers and the 34 presidents of the State Societies of Professional Engineers. Preparation of the book was sponsored by the Massachusetts Society of Professional Engineers. It was presented by W. F. Ryan. Other AIEE officers elected were: Vice-Presidents, C. G. Veinott, Lima, Ohio; W. J. Seeley, Durham, N. C.; W. C. DuVall, Boulder, Colo.; Ralph A. Hopkins, Los Angeles, Calif.; A. H. Frampton, St. Catherines, Ont., Canada; Directors, E. W. Davis, Cambridge, Mass.; N. B. Hinson, Los Angeles, Calif.; H. J. Scholz, Birmingham, Ala.; Treasurer, W. I. Slichter, New York, N. Y.

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Oak Grove Plant Burns

The plant of the Oak Grove, La., Utilities Co was destroyed by fire June 14. Loss was estimated at $80,000.

ADVERTISING MANAGERS talk over the program for the annual Public Utilities Advertising Association convention with Walter C. Beckjord, president, Cincinnati Gas & Electric Co. Left to right are Herbert Briggs, Jr, advertising manager, Philadelphia Co, and retiring PUAA president; Clara H. Zillessen, Philadelphia Electric Co, the only woman serving as advertising manager of a large electric utility; Beckjord and Floyd I. Fairman, advertising manager, Kentucky Utilities Co, and incoming PUAA president

Advertising Techniques, Not Policies, Stressed at Annual PUAA Meeting

ADVERTISING techniques rather than broad policies were emphasized last week at Cincinnati as the Public Utilities Advertising Association held its annual convention at the Netherland Plaza Hotel. Attendance of 170 at the two-day meeting included advertising managers of most of the larger electric and combination companies.

The menace of public power to the industry was brought out in two speeches. G. Edward Pendray of Pendray & Liebert approached the problem from the national viewpoint, and John Dierdorff, vice-president, Pacific Power & Light Co, explained the situation in the Pacific Northwest.

"A utility which is not doing a good job of public relations today is not only a menace to its employees, stockholders, and customers, but also to the entire industry," Pendray asserted. He derided the idea that there are bumper states in the battle between private and public power. So long as public power exists utilities in every state are menaced, he said. Every person in the industry must assume that the battle against public power is his own.

The public relations expert warned that the battle must be won not in Washington but locally everywhere. And the time to start is now even if no public power job is in the offing. He emphasized that house organs are a great help in educating employees, who are very influential locally.

The association paid tribute to its past presidents at a special service held in connection with the luncheon on the last day of the convention. Harold S. Metcalfe, West Penn Power Co, and himself an ex-president, gave the address. Nine of the 24 persons who have served as PUAA presidents were present and were given inscribed desk sets and certificates. Seven former presidents have died. The remainder either have left the industry or were unable to be present.

Herbert Briggs, the Philadelphia Co, was given his certificate and gift following the election of Floyd I. Fairman, Kentucky Utilities Co, as president.

Other officers elected are William B. Hewson, Brooklyn Union Gas Co, first vice-president; John E. Canfield, Wisconsin Power & Light Co, second vice-president; Paul L. Penfield, Detroit Edison Co, third vice-president; Charles D. Lyon, Potomac Edison Co, secretary; and Mead Schenck, Interstate Power Co, treasurer.

C. E. Parker, Central Surveys, Inc, pointed out that the public in general is ignorant of the problems of the industry and of the dangers of socialism. He declared that the industry can win friends by giving more information to the public. Utility leaders must point out to the general public the dangers which also face them if private power loses its battle to withstand encroachment by federal or local public power.

Dierdorff warned that if privately owned utilities are to stay in business they must sell the value of their service and must fight at the local level. He showed how difficult the fight is in the Northwest, where the one great power source is the Columbia. If the utilities succeed in blocking federal projects, they must be in a position to assume the construction of these projects themselves. The Northwest must have this power available. He indicated that the utilities are willing to reconcile themselves to public power generation but will fight to the end any Columbia Valley Administration or similar all-powerful independent agency.

41 More Customers

The electrical age will arrive on Coosaw Island, S. C., soon—if the Army Engineers agree. South Carolina Power has asked permission to run an overhead cable to the island, now occupied by 40 families and a boat works.

$18 Million in Contracts Let for New Johnsonville

Contracts totaling approximately $18 million have been awarded by the Tennessee Valley Authority for equipment for the New Johnsonville plant.

Largest contract went to General Electric for three turbo-generators of 125,000 kw capacity, to cost $7,448,700. Combustion Engineering-Superheater, Inc, received a $4,338,640 contract to furnish three boilers.

Ingersoll-Rand Corp. will supply three condensers for $800,000; Lummus Company, New York, 12 feed-water heaters $200,000; American Blower Corp, Detroit, six fans, three induced and three forced-draft, $350,000.

Lynch Heads Texas P&L

W. W. Lynch, executive vice-president of the Texas Power & Light Co, Dallas, Tex., since 1947, has been elected president and general manager of that company. He succeeds John W. Carpenter, who has been named chairman of the board.

SEC RULINGS

Kansas Gas & Electric Co has received conditional exemption from competitive bidding in connection with the proposed sale of 550,000 shares of its common stock (no par). Kansas Gas has proposed the issuance and sale of 100,000 shares of this stock, and its parent, American Power & Light Co, had proposed the sale of its holdings of 450,000 of the 600,000 outstanding shares of the stock. Both had sought permission to negotiate for the sale of the 550,000 shares, reserving the right to sell reduced amounts of the shares at this time (and the balance later) if negotiations for the sale of the entire block proved impossible or unsatisfactory. The Commission, however, granted the request for exemption from competitive bidding only on condition that sale of the entire block of 550,000 shares be consummated within the immediate future. Such disposition, the Commission indicated, would avoid the possible delay which would result from piecemeal sales and which would interfere with American's proposed additional investments in its other operating subsidiaries and Kansas' urgent needs for construction funds. American proposes to use the proceeds of its sale of the Kansas stock to make additional equity investments of $7,000,000, $6,000,000 and $2,500,000, respectively, in Texas Utilities Co, Florida Power & Light Co, and Pacific Power & Light Co, which investments are considered necessary prerequisites to compliance by American with a commission order directing its dissolution. (Release No. 9150).

North American Co and **North American Light & Power Co** have received authorization to offer for sale at competitive bidding their remaining common stock holdings in Illinois Power Co. Proposal involves the sale by North American of 72,785 shares and by Light & Power of 170,000 shares of the Illinois stock. Proceeds to North American would be added to its general funds, while Light & Power would apply the proceeds to the prepayment of outstanding bank loan notes due Dec 31, 1949, and amounting to $5,000,000. North American also was authorized to make stabilization purchases of the Illinois stock on the New York Stock Exchange on the date scheduled for the opening of bids, any shares so acquired to be sold over the Exchange as soon as practicable after the consummation of the sale of the 242,785 shares. (Release No. 9151).

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Puget Sound P&L, PUD Agrees on $16-Million Sale

Things have begun to move again in the western Washington power stalemate. Puget Sound Power & Light Co has reached an agreement with the Snohomish County PUD for sales of its distribution facilities in Snohomish County and adjacent Camano Island for $16 million, and Mayor William F. Devin of Seattle is urging that the city's negotiations with the company be "carried on as rapidly as possible."

DR KARL T. COMPTON has been elected a director of the McGraw-Hill Publishing Co. An outstanding scientist and educator, he is now chairman of the Research and Development Board of the National Military Establishment and chairman of the corporation of Massachusetts Institute of Technology

The sale to Snohomish is conditioned on the immediate dismissal of the PUD's pending condemnation action against the company. Officers of the company have contended that the overall acquisition of Puget Sound P & L properties by a group of PUD's is not legally possible as long as that suit and three others are pending.

To the stated price will be added accounts receivable and net additions from Jan 1 to the closing date. If it appears that an overall acquisition of the company's property can not be consummated by Oct 31, the company will sell its Snohomish and Camano Island properties to the PUD Oct 1.

The transaction involves about 12% ($3,421,000) of the company's total gross revenue for 1948 and around 15% (38,358) of the total electric customers. The PUD agrees to retain for at least two years company employees engaged in operation of the properties.

Since no Northwest Power Pool facilities are included in the property to be sold, the Snohomish PUD will obtain its power supply from the Bonneville Power Administration under a 20-year requirements contract.

"The dismissal of the Snohomish PUD condemnation case is essential to a constructive solution of the critical power problem in Puget's service area," said Frank McLaughlin, Puget Sound P & L president. "The price is fair."

Other condemnation suits pending against the property have been brought by the City of Tacoma and the Kitsap and Thurston PUD's against the 23,000-kw Electron plant on the Puyallup River and the 62,000-kw White River plant near Dieringer.

Mayor Devin, in his annual report, emphasized the power shortage as a principal problem before the city's government. He insisted that generating facilities should be included in any purchase but expressed confidence "a proper and equitable plan" can be worked out with Tacoma and the PUD's as to the acquisition of these facilities.

MEETINGS

NYS Assn. of Elec. Contractors & Dealers, Inc.
Golden Anniversary Convention, Saranac Inn, N. Y., July 2-9.

American Institute of Electrical Engineers
Pacific General Meeting, Fairmont Hotel, San Francisco, Calif., August 23-26.
*Midwest General Meeting, Netherland Plaza Hotel, Cincinnati, Ohio, October 17-21.

Maryland Utilities Association
Fall Conference, Cavalier Hotel, Virginia Beach, Va., September 9-10.

Rocky Mountain Electrical League
Fall Convention, Stanley Hotel, Estes Park, Colo., September 11-14.

Instrument Society of America
Clinic on Maintenance of Industrial Instruments, Statler Hotel, St. Louis, Mo., September 9-12; Annual Convention, Municipal Auditorium, St. Louis, September 12-16.

Illuminating Engineering Society
National Technical Conference, French Lick Springs Hotel, French Lick, Ind., September 19-23.

Pennsylvania Electric Association
Annual Meeting, Benjamin Franklin Hotel, Philadelphia, Pa., September 20-21.

National Electronics Conference
Edgewater Beach Hotel, Chicago, Ill., September 26-28.

★ **Indiana Electric Association**
Annual Convention, French Lick Springs Hotel, French Lick, Ind., September 28-30.

National Television and Electrical Living Show
Second Annual Show, Sponsored by Chicago Electric Association, Chicago Coliseum, September 30-October 9.

★ **National Association of Corrosion Engineers**
South Central Region, Adolphus Hotel, Dallas, Tex., October 3-4.

★ **Canadian Electrical Manufacturers Association**
Annual Meeting, General Brock Hotel, Niagara Falls, Ont., Canada, October 4-6.

★ **Iowa Utilities Association**
Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, October 10-11.

★ **American Society for Testing Materials**
First Pacific Area National Meeting, Fairmont Hotel, San Francisco, Calif., October 10-14.

★ **American Standards Association**
Annual Meeting, Waldorf-Astoria Hotel, New York, October 11-14.

★ **Pennsylvania Electric Association**
Transmission and Distribution Committee, Fort Ligonier Hotel, Ligonier, Pa., October 20-21.

★ **National Safety Council**
National Safety Congress and Exposition, Stevens, Congress, Morrison, Sherman Hotels and the Palmer House, Chicago, Ill., October 24-28.

★ **National Metal Trades Association**
Annual Convention, Palmer House, Chicago, October 26-28.

★ Additions this week

Electric Energy Output Rose 5.3% in March

Production of energy by electric utilities during March totaled 24,721,247,000 kwhr, the highest March production total of record, the Federal Power Commission reports. The March total was 5.3% over last year's and 7.5% above the 22,996,048,000 kwhr produced during February, 1949.

Water power plants produced 8,136,299,000 kwhr in March. This is the highest monthly water power output of record, exceeding by 3.2% the previous record set in April, 1948, and an increase of 8.9% over the 7,473,275,000 kwhr monthly production of a year ago. As a percentage of March total production, water power output increased from 31.8% last year to 32.9% this year.

Combined utility and industrial production during March was 5.5% above the same month last year, and for the year ended Mar 31, 1949, was 8.2% above the same period a year earlier.

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Allis Strike Chief Freed By Supreme Court Ruling

The U. S. Supreme Court this week set aside the conviction of Harold Christoffel, former president of the CIO United Automobile Workers Local 248, at Allis Chalmers in Milwaukee, on charges of lying about alleged Communist connections before the House Labor Committee in 1947.

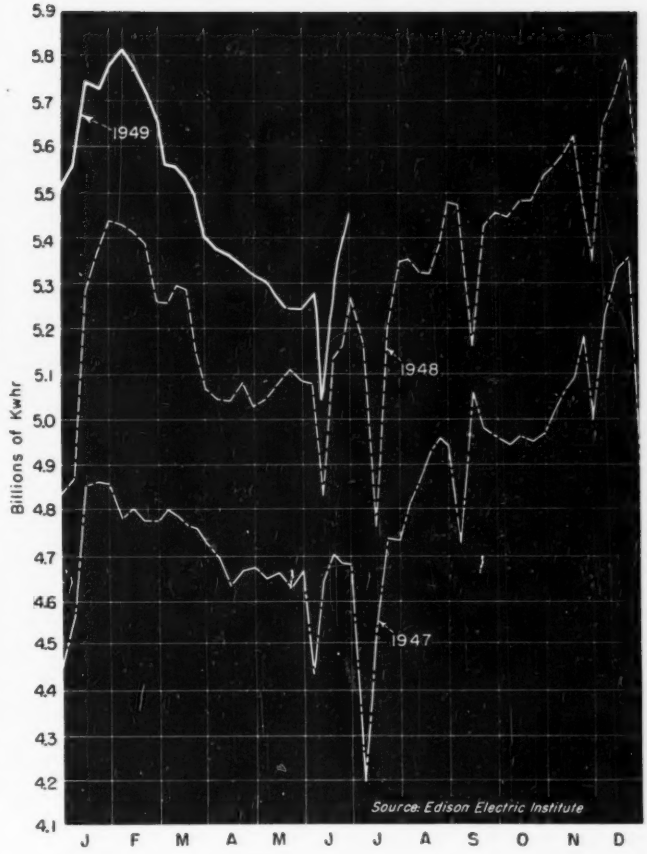
Basis for the decision: The trial judge, Federal Judge Edward M. Curran, erred in his instructions to the jury regarding the need for a Committee quorum when the alleged perjury occurred.

Christoffel contended at his trial that a quorum of 13 Committee members was not present when he testified. Judge Curran advised the jury that the government had to prove only that a quorum was present when hearing began.

In a 5-4 decision, the Supreme Court agreed with Christoffel that the instruction was improper. Justice Frank Murphy said for the majority that unless a quorum was present when Christoffel testified, the committee was not a "competent" tribunal under the general rules set up and followed by the House. This does not necessarily apply in the Senate.

Retrial of the case appeared unlikely unless the government is in a position to prove that 13 Committee members heard the alleged perjury.

Christoffel denied that he was a Communist or that he knew or associated with certain Communists in Wisconsin.



Output Continues on Upward Swing

For the third consecutive week, the output curve move upward during the week ended June 25, 1949, according to figures released by the Edison Electric Institute.

The amount of electrical energy distributed totaled 5,466,169,000 kwhr, compared with 5,372,600,000 kwhr during the preceding week.

During the corresponding week last year, ending on June 26, the amount of electrical energy distributed totaled 5,256,698,000 kwhr, this year's figure representing an increase of 4.0%. This percent change compares with a 4.1% increase for the preceding week.

The New England States remained in the plus column with an increase of 2.4% comparing with a 0.7% increase for the preceding week. The Mid-Atlantic group reported —0.0% while the Central Industrial States reported an increased loss, 1.1%, compared with 0.6% for the preceding week.

The largest individual gain was again shown by the Pacific Coast States, 15.5%, with the Rocky Mountain group running a close second, 14.3%.

Weekly Output, Millions Kwhr

1949	1948	1947
June 25 5,466	June 26 5,257	June 28 4,675
June 18 5,373	June 19 5,159	June 21 4,676
June 11 5,300	June 12 5,132	June 14 4,702
June 4 5,018	June 5 4,845	June 7 4,635
May 28 5,270	May 29 5,076	May 31 4,429
May 21 5,255	May 22 5,085	May 24 4,663
May 14 5,257	May 15 5,109	May 17 4,616
May 7 5,284	May 8 5,087	May 10 4,653
Apr 30 5,304	May 1 5,042	May 3 4,640
Apr 23 5,326	Apr 24 5,027	Apr 26 4,668
Apr 16 5,343	Apr 17 5,087	Apr 19 4,660
Apr 9 5,360	Apr 10 5,033	Apr 12 4,620

Percent Change from Previous Year

	June 25	June 18	June 11
New England	+ 2.4	+ 0.7	— 6.0
Mid-Atlantic	— 0.0	— 0.5	— 3.6
Central Industrial	— 1.1	— 0.6	— 1.4
West Central	+ 5.7	+ 2.6	+ 4.5
Southeast	+ 1.6	+ 2.5	+ 3.6
South Central	+10.1	+ 4.3	+ 8.6
Rocky Mountain	+14.3	+12.6	+10.5
Pacific Coast	+15.5	+21.4	+20.7
Total United States	+ 4.0	+ 4.1	+ 3.3

WASHINGTON COMMENT

WILLIAM B. WHICHARD

CONGRESSIONAL hearings all too frequently develop volumes of testimony having little or no bearing upon pertinent facts. But the study of President Truman's proposed Columbia Valley Administration by Senate and House committees promises to set a new record for irrelevance, inanities, and sheer nonsense.

An aura of unreality surrounded the proceedings of the two public works committees almost from their inception on June 20. Few, if any, members of Congress seriously believe that CVA legislation can go beyond hearings during the present session. Too many more important issues, from the national viewpoint, at least, must be acted upon—labor, housing, foreign aid, and federal reorganization, to name a few.

Further, an effort to create a new TVA-type agency always encounters considerable inertia, if not outright opposition, in the Capitol. Even some habitual and outstanding defenders of TVA activities and spending are reluctant to sponsor another regional authority. Much of this sentiment stems from the traditional dislike of a surrender of any Congressional prerogatives. No other federal agency enjoys so much freedom from Congressional supervision of its activities as TVA, which is tied to the legislative body only by a comparitively slender purse-string.

Perhaps the Administration insisted on the opening of the CVA hearings for this very reason. To get a CVA next year, or within a reasonable time thereafter, the campaign to "sell" Congress the idea had to start soon, it may have been reasoned. At any rate, Administration men demanded the hearings—even to the extent of stirring up further Congressional hostility to CVA.

Adding to the illusion of fantasy was the appearance of top Interior Department and other agency officials to endorse the CVA proposal. Many of the agencies represented had fought each other bitterly for the right to undertake various phases of resource development in the Pacific Northwest and elsewhere. But there they were, pleading with Congress to set up a new authority which would oust them all henceforth from the Northwest.

A typical sample of the nonsense involved in actual testimony came midway in the long parade of pro-CVA witnesses before the Senate committee. A local member of the National Farmers Union asserted that "special business interests . . . Actually a small minority of the people" of the Northwest were the only opponents of a CVA. Asked to identify these "special interests," the witness finally came up with an amazing list. It included, he said, the electric utility companies (of course) the railroads, lumber and cattle interests, a majority of the region's newspapers, local chambers of commerce—in all, quite a few "special interests."

Again, the same witness warned the committee to expect to hear much from the "very vocal and well-financed" opponents of CVA, who had more time and funds to come to Washington than "the great majority of the people, who are for CVA but not so well organized and represented." At that point, Sen Harry Cain almost fell from his chair. Didn't the witness know that all the testimony so far presented to the committee had been favorable to CVA, the Senator asked? No, the witness had not been informed as to the nature of the previous testimony.

Sen Cain might well have been surprised. For the CVA proponents had lined up a series of top flight witnesses for their cause. In addition to secretaries and assistant secretaries of four departments—Army, Interior, Agriculture and Commerce—they had support from state officials, Grangers, public power people, and other Northwest groups. The CVA cause obviously was "well organized" and "well represented."

TECHNICAL NOTES

ARCHER E. KNOWLTON

Microwaves above 950 megacycles manifest much less reflection and refraction than frequencies below 200 megacycles.

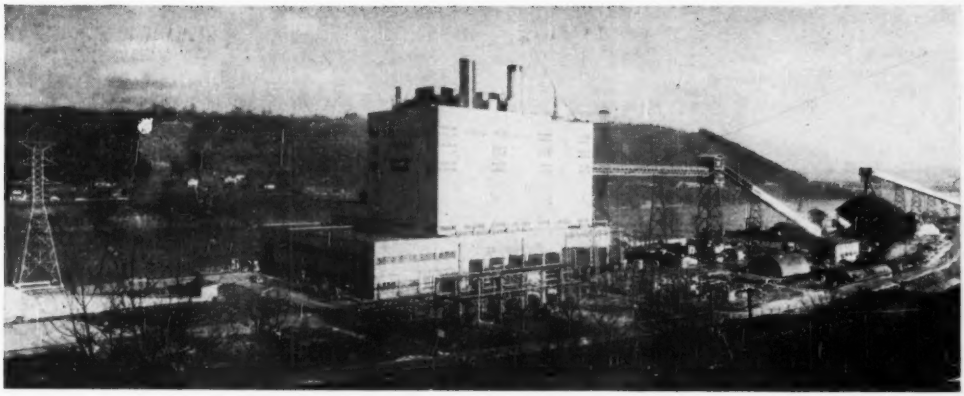
Fluctuating loads arising on a particular system should be confined to that system and not imposed, directly or indirectly, on the interconnected systems. System inertia is instrumental in absorbing the fluctuations before they spread far.

Rectifiers constitute such close coupling between the ac system and the dc load that the protective system of the rectifiers needs to compensate for the unavailability of the buffer afforded by the flywheel effect of the rotating conversion equipment otherwise used.

Grounding devices for maintenance operations should be so placed, of course, as to be effectively protective but not so disposed as to necessitate shifting after the work has been started.

Electrical insulation could conceivably be injured by the wetting agents added to water to extinguish fire. They could promote penetration of both moisture and the conducting salts. Corrosion could also be stimulated.

Reheater tube bank design is a trifle more difficult than ordinary superheater design because overall pressure drop from and back to the turbine must be minimized.



MITCHELL STATION, new two-unit 160,000-kw plant of West Penn Power Co on Monongahela River about 20 miles south of Pittsburgh

Security Through Flexibility Marks Mitchell Electrical Design

Electrical system design of new 160,000-kw Mitchell Station influenced by necessity of supplying two external transmission systems of different voltage which also constitute backup source of system power supply under emergency conditions

H. A. P. LANGSTAFF
Chief Electrical Engineer
West Penn Power Co
Pittsburgh, Pa.

SIX features of Mitchell's electrical system stand out as of significance and interest. These are: (1) A centralized control room, designed for convenient two-man operation, has notable innovations in lighting, communication, metering and annunciator systems; (2) 375-v excitation from direct-connected 3,600-rpm exciter with Rototrol pilot exciter; (3) separate 132-kv and 25-kv substations, both fully automatic and unattended; (4) remote supervisory control of substation feeder breakers from Charleroi five miles away; (5) use of three phase transformers throughout the station in preference to banked single phase units; (6) auxiliary power supply from 2,300-v sectionalized ring bus with three points of supply.

Site of West Penn Power Co's new 160,000-kw Mitchell Power Station is virtually an ideal plant location. Spotted in a sweeping bend of the Monongahela River 18 miles from Pittsburgh, designers had three vital things near at hand and in ample supply; mine-mouth coal, water and a heavily-industrialized load area.

Long a favored power site, 132-kv lines had been built in the area with a definite coordinated plan to connect with a station at this point. In this location near Charleroi substation, transmission "hub" of the West Penn system, Mitchell has relieved load on vital transmission circuits and eased the need for immediate investment in new lines.

There is sufficient flow in the Monongahela River past Mitchell Station to supply condensing water for a 320,000-kw development even under low-water conditions. Ultimately Mitchell will be a four-unit station of about this size. However, the present $28,000,000 plant comprises two 80,000 units with three 500,000 lb per hr boilers supplying steam at 1,250 psi 925 F. Its first unit went into operation in mid-December 1948, two months ahead of schedule; the second is scheduled for late 1949.

Central Control Room

Electrical and mechanical control of Mitchell station is built around an air-conditioned sound-proofed central control room. From this room equipment pertinent to operation of the station can be started up, shut down or adjusted by two men.

Because of this concentration of control in the hands of only two operators, every effort has been made

CONTROL ROOM from which two men regulate operation of two turbo generators, three boilers as well as auxiliaries and electrical apparatus. Average initial illumination on vertical boards was 46 ft-c, on bench boards 85 ft-c on desk tops 40 ft-c

to build convenience and accessibility into the control room facilities.

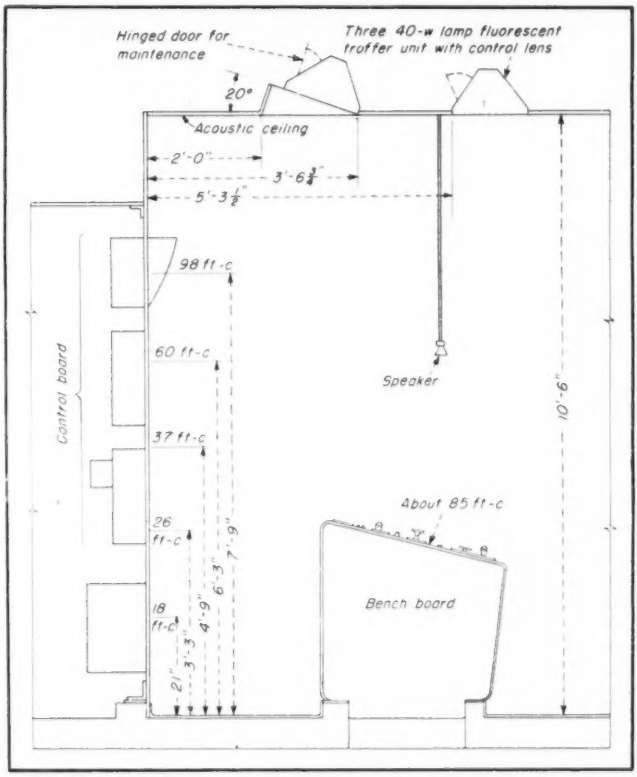
Controls and instrumentation for the generators and main transformer banks are in a vertical duplex-type switchboard, selected for its advantages of operating simplicity, ease of maintenance and standardization of construction.

Specially designed benchboards and vertical boards were selected for the mechanical control devices because of the great number of control points and metering devices involved.

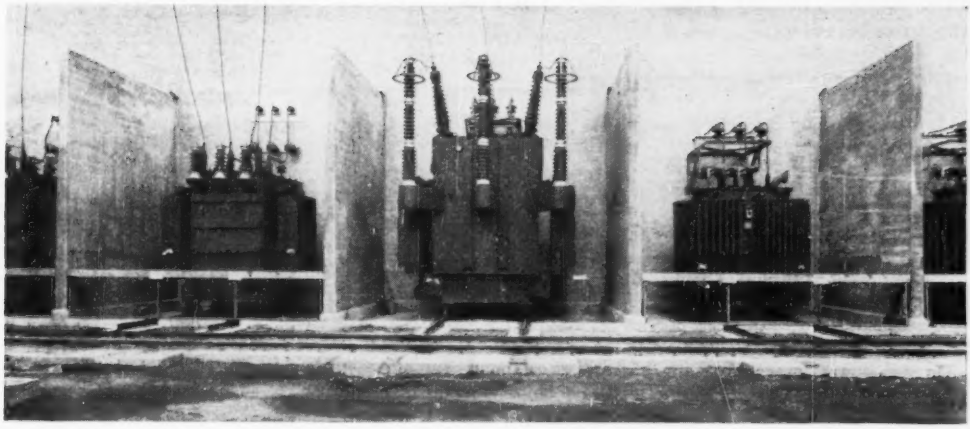
Printometers that record the output of generators and auxiliary transformers, relieve operators of the task of taking hourly readings at specific times. Frequency lights are provided to guide operators in picking up and dropping load so that actions will not be taken contrary to system load requirements.

There are no protective relays in the control room. However, a series of pushbuttons have been installed, along the bottom of the electrical control switchboard, so that operators can reset multi-contact tripping relays on power station equipment. All protective relays and multi-contact tripping relays for all station equipment (except the 25 and 132-kv switchyard and the 2,300-v auxiliaries) are in a duplex switchboard on the floor above the control room. Switchboard for the 25-kv and 132-kv equipment is in the control building outside the power plant.

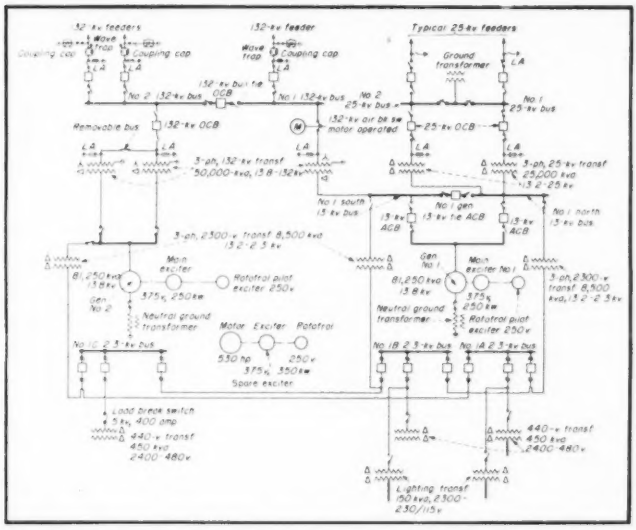
Large-type, back-lighted annunciator panels are located above each switchboard. Lights for each of these visual annunciator panels are two 25-w lamps in series across the 250-v d-c system. Supplementing these visual signals a common station au-



LIGHTING UNITS in control room are maintained from above ceiling through hinged doors in the flush-mounted troffer units. Initial illumination at points on vertical board is shown.



MONEY WAS SAVED by using 3-ph transformers instead of banks of single phase units. Three phase transformers shown left to right are: Two 25,000-kva 13.2/25-kv units; one 50,000-kva 13.2/132-kv unit; and two 8,500-kva 13.2/2.3-kv station auxiliary transformers



ELECTRICAL SYSTEM for units No. 1 and 2 provide ultimate in flexibility for serving external 25-kv and 132-kv systems

dible alarm is given, coincident with the flashing of a single-lamp on the master board. The audible alarm can be silenced but the visual signal remains until indicating contacts are cleared. A single test button on the master panel checks all annunciator lights.

The loud speaker network for the plant has microphones and speakers at strategic points among them the control room, burner decks and near turbine throttles. In the control room these microphones are suspended from the ceiling at points adjacent to control boards, allowing close surveillance of control switches and meter indications during an exchange of oral instructions over the system. A carrier channel also links the control room with the system dispatching center at Charleroi.

Objective of the control room lighting design was to provide uniform illumination from sources throughout the ceiling. In order to avoid the confusion that would result in the control room from the introduction of ladders and other paraphernalia, all lighting maintenance is performed from above the ceiling. The flush lighting units are hinge-mounted to swing up into an unoccupied area above the ceiling where they are cleaned without disturbing station operators. Fluorescent tubes are used for all normal lighting and incandescent for emergency lights.

The air conditioning system made complete ceiling illumination impracticable, however, the above-the-ceiling maintenance program was adhered to by providing flush-type troffer units of standard design. Control lens units were used to secure high intensity illumination on vertical switchboards.

Generator Excitation

Both Mitchell generator units are 3,600-rpm machines rated 81,250 kva at 13,800-v, 80% power factor with 0.5-psi hydrogen pressure. Excitation is provided by 250-kw, 375-v direct-connected two-bearing flexibly-coupled exciters. Because of a possible greater generator capacity in the future installations the higher excitation voltage was used to reduce the size and meet industry standards.*

Exciters have three shunt fields; one that is 375-v self-excited, the second a control field excited from a Rototrol pilot exciter on the same bed plate and the third a 250-v battery-

* Philosophy of higher voltage excitation will be discussed in a forthcoming article in Electrical World.

excited field for emergency starting. The station has two 250-v batteries; one for control and one for power supply to motor operated valves, emergency lighting etc.

A spare motor-driven 250-kw, 375-v, 1,200-rpm exciter and a two-stage direct-connected Rototrol pilot exciter is provided. It is driven by full voltage starting squirrel-cage induction motor supplied from the 2,300-v auxiliary bus. Impedance-type static networks provide automatic voltage regulation for the main generator, the spare exciter and direct-connected pilot exciters.

Bus Layout

Necessity for supplying both a 25-kv distribution and a 132-kv transmission system from Mitchell Station made it necessary to divide the 13.8-kv generator bus of the first unit into two sections linked by a normally-closed tie breaker. The north section supplies the 25-kv switchyard bus through two separate 25,000-kva, 3-ph, step-up transformers. The south section is connected with the 132-kv switchyard bus through a 50,000-kva, 3-ph, step-up transformer and motor-operated air break switch.

With this arrangement when the tie breaker between sections of the 13.8 generator bus of unit No. 1 is closed, power can be exchanged between the 25 and 132-kv systems with unit No. 1 out of service. Or in the event of trouble on either system the other can be supplied by unit No. 1 by opening the tie breaker between bus sections.

Availability of these two more or less independent external systems (25 and 132 kv) was reflected in the alternative supplies to station auxiliaries, to be discussed later.

Unit No. 2 at Mitchell and all future generators will connect to the 132-kv system only. It should be noted that unit No. 2 has no 13.8-kv switchgear. Transfer of power from the 13.8-kv generator bus to the 132-kv switchyard bus is through two paralleled 50,000-kva, 3-ph transformers and a common 132-kv oil circuit breaker. Provision is made for future air-break switches on the 132-kv side of these transformers if experience shows that their installation is advisable.

Use of two 50,000-kva transformers in parallel in preference to a single unit of a larger size was in the interest of security and economy.

VITAL STATISTICS OF MITCHELL STATION

No. Turbo Generators	2
Capacity, each kva @ 80% pf	81,250
No. Boilers	3
Capacity, each, lb per hr	500,000
Steam pressure, psi	1,250
Steam temperature	950
Cost, present development	$28,000,000
Ultimate station capacity, kw	320,000

Provision of a 13.8-kv generator bus for unit No. 2 in the absence of 13.8-kv switchgear was to afford a convenient means of connection between generator leads and supply cables to the 132-kv main transformers and the 8,500-kva auxiliary supply transformer.

Considerable saving was achieved in the cost of buswork and foundations through the use of 3-ph transformers instead of banks of 1-ph units. Use of 3-ph transformers was not confined to the main transformers, however. They were also used to supply station power.

Substations Unattended

Both the 132-kv and 25-kv substations are completely unattended and automatic. Control of breakers in the two stations is divided between the power station control room switchboard and the system operating headquarters at Charleroi, five miles away. In general, control of breakers used in synchronizing or that are essential to station operation, are under the control of the station operators while the switching equipment pertinent to line operation is controlled from a substation building in the switchyard through the medium of a supervisory control system that extends to Charleroi substation.

The 25-kv outdoor structure and primary control equipment conform to company standard practice. A 3-ph, 25-kv grounding transformer, zig-zag connected, and a neutral resistor are provided for grounding the 25-kv system. This transformer is normally connected to both sections of the 25-kv bus but may be connected to either section by means of disconnecting switches.

Two of the six 25-kv line breakers are equipped with automatic reclosing relays because there are two automatic sectionalizing air break switches in each of these two lines at points distant from Mitchell station. A definite schedule of reclosure was desired for these two breakers to fit with the air switch operating cycle.

Station Power Supply

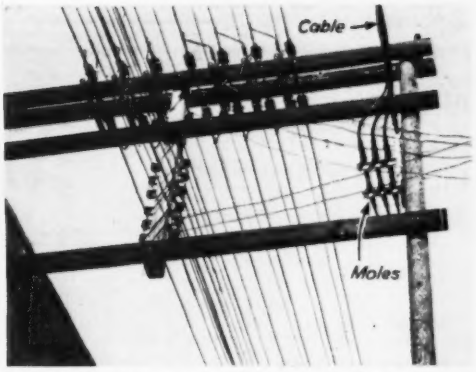
With units No. 1 and No. 2 in operation, principal station auxiliaries are supplied at 2,300-v from a three-section, ring bus, two sources for which are supplied from unit 1 and the third from unit 2. Each 2,300-v bus section can be independently supplied by an 8,500-kva oil-insulated 3-ph transformer connected to the 13.8-kv generator buses. Normally the three station service bus sections are operated separately. However, automatic transfer facilities are provided so that any 2,300-v bus section can be supplied from either of the two remaining sections if its transformer bank should be relayed out of service.

It should be observed from the station electrical diagram that power supply to any and all of the station service bus sections is assured under emergency conditions as long as either the 25-kv or 132-kv external system circuits are available.

Overload relays control the output of the 8,500-kva station service transformers. They function when a fault occurs on the 2,300-v bus sections. They also serve as back-up protection for the 2,300-v feeder breakers, all of which are equipped with time delay overcurrent relays equipped with instantaneous trip device. The auxiliary transformers themselves are operated with type CA differential relays, and as stated, when they operate the 2,300-v bus is automatically transferred to another transformer bank.

One of the 2,300-v circuits of each bus supplies power to a double-end substation consisting of two 600-kva, 2,400-v dry type transformers which supply miscellaneous power station and coal handling circuits. Also connected to the 2,300-v buses are two 150-kva dry-type lighting transformers.

SPINNING the 500,000-cir mil aerial secondary cable in the field. Preliminary cost estimate covering labor and material was $3.70 per ft



AERIAL CABLE is terminated in Burndy Moles at alley structures to provide for service connection. Secondary wires on racks will be moved

An Aerial Cable Secondary Network

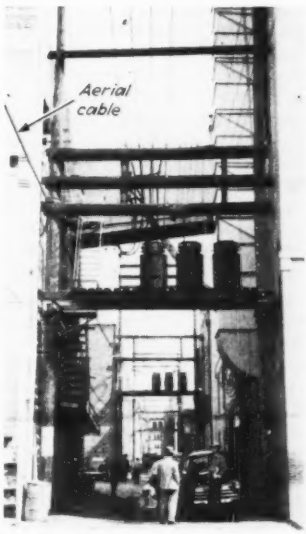
Texas utility pioneers with first aerial cable a-c secondary network system. Selected in preference to open wire network in downtown area it offers improved appearance and service at fraction of underground cost

T. D. THOMAS
Chief Engineer
Texas Power & Light Company
Dallas, Texas

LIKE MANY other electric utilities Texas Power & Light Co in recent years has been considering means of improving the appearance of and service rendered from its distribution systems serving business districts in communities where higher load densities have caused the service facilities to become congested.

While underground systems could be installed, as an alternative to overhead systems, none of the towns served by this company are of sufficient size to justify the cost of installing underground systems. It therefore has become desirable to develop some alternate and less expensive method of improving the appearance of heavier distribution systems.

Out of this need has come an aerial cable secondary network system now almost completed in Waco, Texas. So far as we know, this is the first aerial cable secondary network installation in the United States. The 500,000-cir mils cable is the largest aerial cable that has ever been installed using the spinning method pioneered by the Florida Power & Light Co.*



BANKS of three 100 kva transformers with network protectors are at 250-ft intervals, served by 4150-v open wire feeders

Prior to the development of the Waco network, the company made its first aerial cable installation at Tyler, Texas where load growth in the downtown area had advanced beyond the limits of the 2.4-kv primary system. Distribution circuits ran down narrow alleys and clearances could not be obtained for open wiring with a higher primary voltage. Preassembled 15-kv, self-supporting, 3-conductor No. 6 copper shielded cable with $\frac{19}{64}$ in. synthetic rubber insulation was used; supported from a $\frac{5}{16}$ in. HS 30% Copperweld messenger. This

* J. A. Lasseter & F. E. Treat, "The Last Aerial Cable In Field," Electrical World, April 24, 1943.

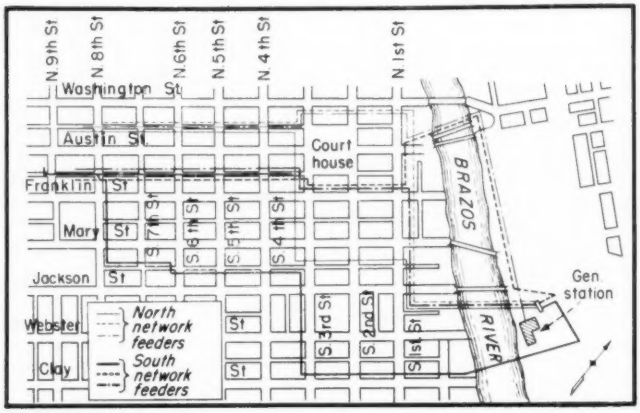


FIG 1—WACO BUSINESS District along Austin Street is supplied aerial cable a-c secondary networks in adjacent alleys to the north and south. Three feeders supplying each network as shown

cable was strung down the alleys from open wire 12.5-kv primary feeders on the cross streets. The cable was terminated at source and load ends with single-conductor potheads to supply transformers mounted on steel racks in the alleys. Four such installations were made early in 1948 and three others will be made this year. Runs were short, being from 500 to 700-ft long.

Situation At Waco

The Waco secondary network was the second aerial cable installation to be made by the company. It involved the largest town on the system, with a population of approximately 100,000 people. Austin Street, the main business district, has 20-ft. alleys on both sides. Other important loads, on Franklin and Washington Streets, parallel the alleys to the north and south. Service is provided from circuits strung on H-frames that span the alleys.

Loads in the business district had grown and facilities added in the past until there were as many as 27 secondary wires at some places in the alleys. Yet load had grown to such an extent that additional facilities were absolutely necessary. Earlier investigations of aerial cable indicated that the situation at Waco was ideal for the installation of a secondary network. However company engineers had also been studying the use of weatherproof conductors on an overhead open-wire network, as an alternative.

In comparing the open wire and the aerial cable network it was recognized that fault current on a network would be several times that where transformer banks of the same size operate on a radial system. In an open wire network fault currents are often large enough to pull conductors together in mid-spans unless sufficient separation is maintained. But then the increased reactance results in voltage drop too great for satisfactory operation. With aerial cable, however, phase wires are close to each other, thereby reducing the reactance of the circuit. If weatherproof wires at 4-in. spacings are compared with aerial cable of the same size, the weatherproof wire is found to have 55% more reactance which, at 80% power factor, amounts to 33⅓% more voltage drop. Thus that for the same voltage drop, open wiring would have to be one-third larger in size than the aerial cable and at 12-in. spacing, the spacing normally used, the voltage drop for open wiring is still greater.

These considerations together with such other things as improvement in appearance and freedom from faults, influenced the decision to install an aerial cable secondary network at Waco.

Each alley will be served by three separate 1/0 copper, 4,160-v open-wire primary circuits and a continuous 4-w, 125/216-v aerial self-supporting cable. In the north alley transformer banks are spaced at 250-ft intervals. They consist of three 100-kva single-phase units on 18-ft steel transformer racks with secondary network protectors. Transformer banks are connected to alternate primary circuits. This will allow ⅔ of the banks to operate with one of the three primary circuits out of service. The south alley has spot networks, consisting of three 112-kva. three-phase transformers, each operating from a different primary circuit with the secondaries in parallel. Cable limiter fuses are used in place of the network protectors in this alley. This also will allow ⅔ of each bank to operate with one primary circuit failure. The two alleys, at present, have a load of approximately 3,000 kva each and the ultimate capacity of the networks will be approximately 7,200 kva. each.

Messenger Data

This secondary network, operating at 125/216, uses three 600-v, 500,000-cir mils stranded copper conductors with 6/64 in. synthetic insulation and 4/64 in. neoprene jacket. The cables are colored red, white, and black for easy phase identification. They are lashed to a 5/8 in., type E, 4/0 copper equivalent Copperweld messenger wire which acts as a neutral conductor and cable support. This messenger has an ultimate breaking strength of 20,730 lb. It was pre-stressed for 24 hours at 10,300 lb, 50% of its breaking strength, before installation at a tension of about 3,000 lb for 60 F. By pre-stressing the messenger, the structures, messenger, messenger splices, and guys were subjected to better than medium ice loading without subjecting the cable to damage in the event of failure. Moreover, practically all permanent stretch is removed from messenger, insuring consistent final loadings and sags. This is an important point in favor of spinning aerial cable rather than installing preassembled cable.

Span lengths in the two alleys vary from approximately 80 to 140 ft. With the messenger strung so as to

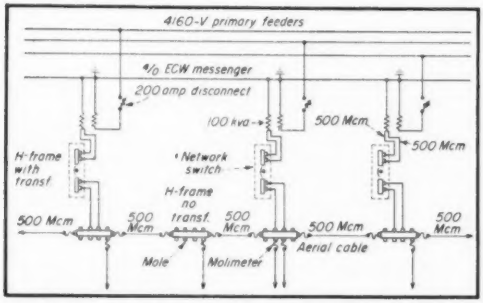


FIG 2—NORTH ALLEY network has three 100-kva, 1-ph transformers with network protectors on alley racks 250 ft apart. Network has 500,000-cir mils aerial cable terminated at each structure in Moles to which service leads are tapped

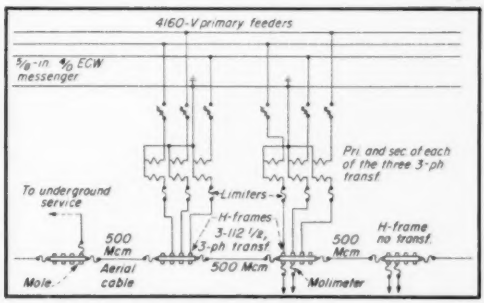


FIG 3—SOUTH ALLEY has spot networks comprising three 112-kva, 3-ph transformers. Limiter fuses are used in place of network protectors and are mounted with the transformers on H frames spanning the alleys

work at 30% of ultimate tension at 60 F with cables attached, the mid-span sag of 27 in. was calculated for a 130-ft. span. With $\frac{1}{4}$-in. ice and a 4-lb wind at 30 F, the sag with a messenger tension of 7,600 lb was calculated to be 26 in. With no ice or wind, tension at 30 F was calculated to be 6,800 lb. This relative small change in tension with ice is another factor in favor of aerial cable over open wiring where important loads are to be served. Also, less conductor area is exposed for ice accumulation where the conductors are grouped in a composite cable.

The cable was terminated at each structure in Burndy Moles. Connectors to the Moles are made with Burndy socket and nut assemblies and compression cones for 500,000-cir mils cables. This was done in order to provide for the service leads and for the installation of additional transformer banks in the future. Due to this method of construction, there are no splices. However, if it ever becomes necessary, we are prepared to make splices using a compression type sleeve and a hand operated hydraulic indenting tool. The length of cable required for each span and for termination in the Moles was determined by measuring the distance between the structures and adding $2\frac{1}{2}$ ft for sag and to provide for the Mole connection.

Spinning Operations

In spinning the cable in the field a stringing trolley, riding the messenger wire on two grooved wheels, is pulled along ahead of the spinner. Three fingers in the front of the trolley straighten out any twists in the cable within the span. Behind these fingers is a large flat pulley that supports the weight of the cables. A parabolic-shaped pulley at the rear of the trolley forms the cables into a triangular configuration with the apex pointing down.

The spinner rides along the messenger behind the stringing trolley on two small grooved wheels. Cables are carried through the machine on pulleys at the front and rear. The rear pulley is adjustable to accommodate various diameters of cables, and to hold the cables snugly against the messenger in a triangular configuration. As the machine is pulled along the messenger, the drum containing two small reels of lashing wire rotates around the entire assembly, binding the cables tightly to the messenger. Lashing wire tension is approximately 35 lb. The drum is rotated by means of friction drive which is actuated by the grooved wheels. The drive ratio of the drum results in a lay of about 16 in. for each lashing wire, but since there are two lashing wires applied 180 deg apart, the resultant lay is about 8 in. The lashing wire used was a No. 10 Copperweld. Two 325-ft coils of lashing wire are sufficient to lash two 130-ft spans of cable.

Both the spinner and the trolley are pulled from the ground with a rope line so arranged that the spinner rides 3-ft behind the trolley. A truck was used for pulling the spinner and trolley as the heavy cables would have required 8 or 10 men to do the job. A uniform job of spinning heavy cables is difficult to obtain if the spinning machine is stopped for any reason between poles. This is especially true if the pulling tension is released.

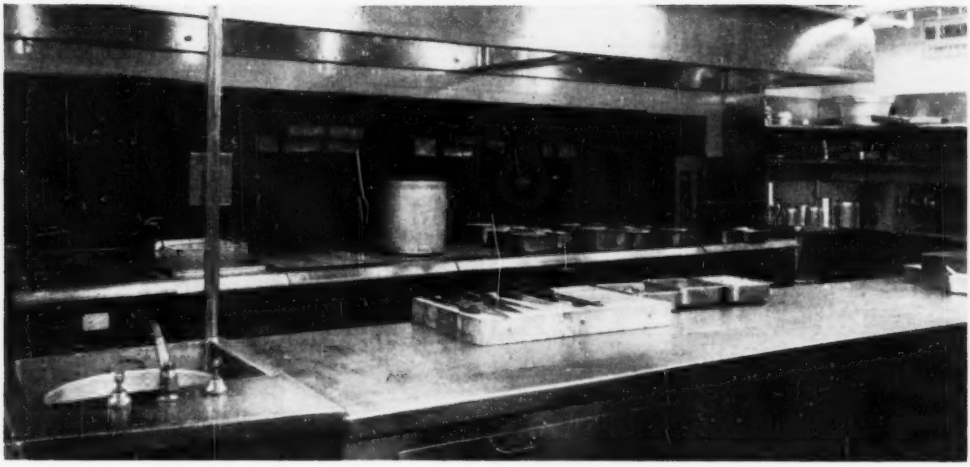
To lash the cables, the trolley is first placed on the messenger and the cables laid between the fingers and on the pulleys in the order of desired phase sequence. Gates of the spinner are opened, the spinner placed over the messenger behind the trolley, and cables lifted into place. Lashing wire is tied off temporarily on the messenger with thumb screw clamps. At this point, the trolley and spinner are pulled to the next pole, applying the lashing wires to the cables as it runs along the messenger.

Street Clearance

The problem of providing street clearance for traffic while spinning was in progress was solved by constructing several pulling blocks having large flat surface rollers on which the cables were supported. These blocks were suspended from the messenger and spaced 6 to 8-ft apart. As the spinner advanced, this train of blocks was pulled ahead until the street crossing was completed.

When the spinner reaches a pole, the lashing wire is tied off temporarily and enough slack is pulled to terminate this wire around the messenger suspension clamps when it is cut. Trolley and spinner are lifted off the messenger by two linemen and passed around the pole, replaced on the messenger, and the cycle repeated.

(Continued on page 68)



COOKING EQUIPMENT in Washington's Ceres Restaurant adds up to a respectable total in connected load

Keeping At It Sells Commercial Cooking

Knowledge of food-service operations and acceptance of utility representatives into the fraternity of the trade are essentials to success in selling cooking service

H. M. BLACKBURN
Potomac Electric Power Co
Washington, D. C.

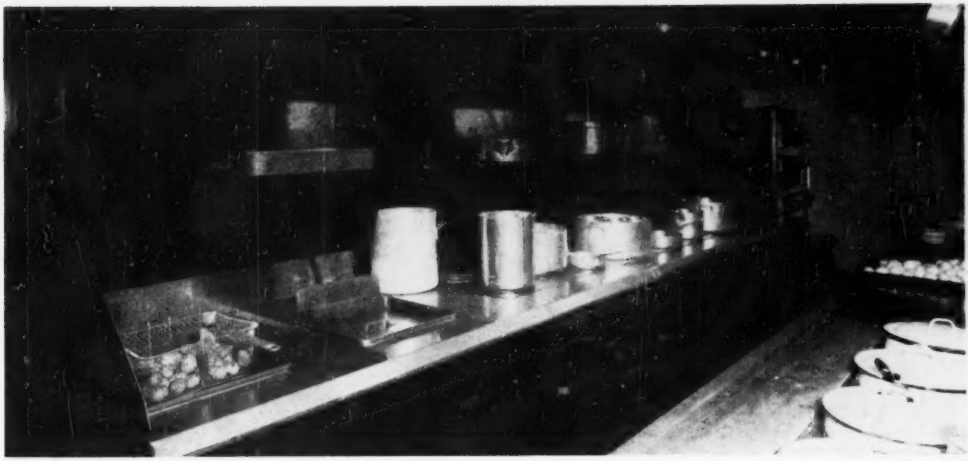
IN 1948, 1,655 kw of new connected load in commercial cooking was added by the Potomac Electric Power Co. Estimated increases in energy sale and in revenue produced by this new load are 2,290,220 kwhr and $41,283. That was the biggest year of a sales activity that started small back in 1935 with the addition of 37 kw with an EAR of $1,110. In the elapsed 14 years a total of 7,549 kw in commercial cooking has been connected and the resulting revenue increase is estimated at $198,782. This averages out to $26.40 per kw connected. The tabulated 14-year record shows that results in commercial cooking promotion come from keeping everlastingly at it.

Against the competition that is encountered in promoting commercial electric cooking, obtaining the confidence and good will of the customer is of utmost importance. Efforts toward this must be continuous and sincere, not merely a means to an end when a customer is considering the purchase of new equipment. We have endeavored to secure the confidence and good will of the restaurateur by becoming a member of the local Restaurant Association and participating in its activities, by acquiring information on restaurants and their operation, and by assisting the restaurateur by means of special services.

As an associate member of one of the outstanding restaurant associations in the United States, we have benefited by their continuous educational programs on management, sanitation and food handling. Attending regular meetings and social functions of the associations has enabled us to become more closely acquainted with food service customers. Res-

Ceres Restaurant's Equipment

Kitchen:	
3—Ranges	65.7 Kw
1—Broiler and oven	16.5 "
1—Fry kettle	18.0 "
1—Fry kettle	7.0 "
2—Food warmers	5.5 "
1—Bain Marie	4.0 "
Pantry:	
1—Roll warmer	1.0 Kw
Hot shelves	9.2 "
2—Coffee urns	10.0 "
1—Toaster	2.5 "
Miscellaneous	2.5 "
Short Order Grill:	
1—Range	15.9 Kw
1—Platter warmer	9.0 "
1—Broiler	10.5 "
1—Fry Kettle	7.0 "
Lunch Counter:	
2—Coffee urns	10.0 Kw
1—Roll warmer	1.0 "
1—Fry kettle	7.0 "
1—Sandwich grill	1.3 "
Bake Shoppe:	
3—Bake ovens	37.8 Kw
1—Hot plate	2.0 "
Total	243.4 Kw



COFFEE SHOP in Mayflower Hotel has 171.7 kw of electric cooking

taurant owners, knowing of our activities in the association, talk to us about their problems as though we were one of them, not as an outsider who has something to sell.

We have encouraged our customers to come to us for information, not only about electric cooking equipment, but about any equipment or material used to establish and operate a restaurant. Through these requests for information we very often learn about proposed plans for new restaurants or remodeling existing ones before equipment dealers or architects have been consulted. This enables us to tell the story of electric cooking before competitors have an opportunity to tell theirs. We have also encouraged architects, consulting engineers, electrical contractors, equipment dealers and local manufacturers to depend upon us as a source of information on electric cooking equipment. Contacts made in this manner have enabled us to convince many of this group of the advantages of cooking electrically. This is important because electric cooking equipment is usually not installed where a consulting engineer or architect had advised against its installation.

There are many sources from which to obtain information helpful to the restaurant operators. The Restaurant Association is only one source because not all restaurant owners are members, particularly those who operate small establishments. Talking to restaurant owners about their problems and methods of solving them, helps to compile information which may aid a restaurateur in another locality. Although most operators subscribe to one or more trade publications, many of them do not take the time to read them thoroughly. It is a service, then, to subscribe to the best trade magazines, to read and compile pertinent information and impart this information when it is needed. Information on new products and new ideas for operating restaurants are also obtained by attending the national hotel and restaurant conventions and expositions. All the information collected should be put to good use by making it a practice to offer at least one piece of advice or bit of information each time a call is made upon a restaurateur.

Mayflower Coffee Shop's Equipment

2—Fry kettles	14.0 Kw
4—Ranges	84.6 "
1—Broiler	27.0 "
1—Chef's table	11.0 "
1—Salamander broiler	5.3 "
1—Range	12.0 Kw
1—Griddle	6.0 "
1—Waffle baker	1.7 "
4—Toasters	10.5 "
Total	171.7 Kw

Food service operators appreciate our special services, which include furnishing lighting and kitchen plans, equipment specifications and advice on air conditioning, ventilation, space heating and refrigeration. In rendering these services it is not our intention to interfere with or replace the services of architects, consulting engineers or others, but rather to cooperate and work with them. Our lighting and kitchen plans are often incorporated in architects' plans or used by equipment dealers in preparing bids. Prepared plans, together with advice on air conditioning, ventilation, heating and refrigeration, are given to customers to help them solve their problems so that they may act more intelligently when requesting or accepting bids on equipment.

An important part of the promotional plan is to see that equipment installed does the work expected of it satisfactorily, and is serviced properly so that a solid foundation is created for the successful promotion of electric cooking in the future. Equipment not operating on the correct voltage, causes most of the complaints. Equipment dealers are advised to state the class of electric service for equipment sold, to refer their customers to the utility for advice on wiring and to inform the utility when the equipment is delivered. This procedure insures the dealer that he will have satisfied customers and practically no equipment returns. Making things easier for the dealer encourages him to give

Growth of Commercial Cooking Load, Potomac Electric Power Company

Year	Counter Cooking Equipment Added Kw	Heavy Duty Equipment Added Kw	Total Load Added Kw	Estimated Consumption Kw-Hr	Estimated Annual Revenue
1935	7	30	37	70,500	$1,110.00
1936	37	35	72	125,500	2,160.00
1937	.....	159	159	318,000	4,770.00
1938	220	93	313	579,500	10,343.00
1939	218	280	498	887,000	14,940.00
1940	444	197	641	1,060,000	19,230.00
1941	352	322	674	1,172,000	20,220.00
1942	188	82	270	446,000	8,100.00
1943	15	147	162	316,500	4,860.00
1944	.....	312	312	624,000	9,360.00
1945	.....	445	445	820,778	11,654.00
1946	244	683	927	1,146,751	19,047.00
1947	746	638	1,384	1,778,324	31,282.00
1948	952	703	1,655	2,290,220	41,283.00
Total	3,423	4,126	7,549	11,635,073	$193,782.00

more attention to the sale of electric cooking equipment. Performance of equipment, particularly devices new on the market, should be observed to determine whether it is living up to the claims of the manufacturer and is of the proper size and type to do the work expected of it.

No matter how well constructed an appliance may be, its use should never be promoted unless arrangements have been made for servicing it. Our appliance service department was established to provide repair service for electrical appliances inadequately serviced by other agencies.

We are not in competition with these agencies, but on the contrary have cooperated with them on obtaining service contracts from manufacturers. At the present time we service the majority of heavy duty cooking equipment installed in our territory and carry a complete line of replacement parts for that equipment. Our repair service is available 7 days a week, 12 hours a day for normal service calls, and 24 hours a day for emergency calls. Labor and material required on a service call is charged to the customer or to the manufacturer if the equipment is within the guarantee period. In addition to regular servicing of equipment, a monthly inspection at no cost to the customer is made of all electric fry kettles and heavy duty cooking equipment regardless of make.

The purpose of this inspection is to advise the customer of worn or defective parts so that they may be replaced before they cause trouble. At the time of inspection thermostats are also checked, adjusted if necessary, and other minor adjustments, not requiring material, are made on the equipment at no cost to the customer. We believe the inspection service is essential, at least until heavy duty electric cooking equipment is used more extensively and the restaurant owner considers it as he would a refrigerator and not something special.

Telling the story of electric cooking to our restaurant customers is the third phase of our plan for promoting the use of commercial electric cooking equipment. This part of our plan is similar to that of most utilities. The electric cooking story is told by contacting personally and mailing literature to food service operators, architects, equipment dealers and others; by arranging and conducting demonstrations; by participation in the regional restaurant conventions, and by advertising.

To contact personally customers engaged in serving food, our sales department has a commercial buildings bureau with nine representatives, a school bureau with two representatives and an apartment bureau with three representatives. These representatives handle commercial customers' service requirements, promote commercial electric cooking, lighting, air conditioning, ventilation and heating, and offer the customer other special services.

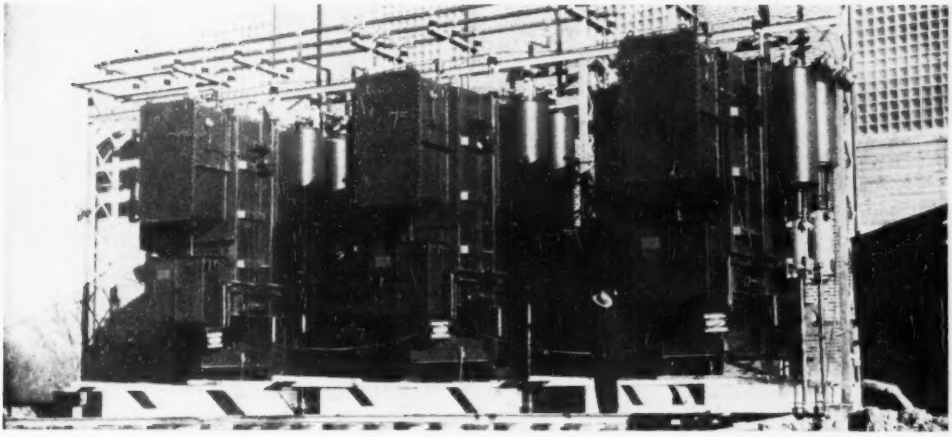
Use Publications

Our sales representatives endeavor to become so well acquainted with the food service operators in their territory that the operators will immediately think of them when problems arise involving the use of electricity. To help the representatives in their contacts and to advise customers of electrical equipment available, catalogues of commercial electric kitchen equipment are given the representatives for distribution. Supplementing personal contacts, *Food Service News*, a well known monthly publication which tells the story of commercial cooking electrically, is sent to approximately 1,200 customers engaged in serving food. Through *Food Service News*, our customers learn how other local establishments and restaurants all over the nation are using electric cooking equipment advantageously. Customers are further contacted by advertising in the *Restaurateur*, which is published monthly for its members by the Washington Restaurant Association.

The special services offered to commercial customers during promotional activities are provided by the commercial engineering department. This department has commercial lighting, power and cooking bureaus, staffed by thirteen engineers. The commercial cooking bureau consists of a cooking engineer and a commercial cooking specialist. These men prepare kitchen layouts, advise customers on the selection, installation, operation and maintenance of electric cooking equipment, and render any other assistance required by the sales department representatives.

The commercial cooking bureau also contacts and advises architects, consulting engineers, dealers and electrical contractors on cooking equipment and its installation. Generally speaking the cooking bureau is looked to as a source of information when any questions arise in the promotion of commercial electric cooking.

Promotional activities are coordinated and furthered by the Electric Institute of Washington, an organization of equipment dealers, contractors, distributors and our company, which was established when we discontinued the sale of appliances in 1934. The Electric Institute assists in the promotion of commercial electric cooking, with the cooperation of our commercial cooking bureau, by providing space and equipment for small group demonstrations, by sponsoring demonstrations at monthly meetings of the Restaurant Association, and by exhibiting commercial cooking equipment at the Southeastern regional conventions and expositions.



INSTEAD OF BUSHINGS, oil-pipe type terminals are used for the 110-46-13.2 kv transformer bank at the Gadsden steam station

Three Oil-Pipe Cable Installations In South Compared

Noteworthy differences in design and installation for three newly completed oil-pipe cables connecting new generating plants to substations and for supplying primary power to center of a city

SEVERAL INNOVATIONS and operating improvements are present in the three newest installations of Oilostatic cables by Southern utilities, which differ somewhat from previous installations. The latest installations completed are by Alabama Power Co at their new Gadsden plant, Tampa Electric Co, and Birmingham Electric Co. In addition, Memphis, Tenn. is installing 26,000 ft of 115 kv, using $5\frac{1}{16}$-in. OD pipe with three single conductors, 500,000-cir mils lead covered type cable.

There are some interesting differences in the installations. For example, Georgia Power used 18 manholes in the 5-mile installation, a cross-town tie between the Boulevard and Grady substations. Birmingham Electric used four manholes in the $1\frac{3}{4}$ mile route from the overhead connections to the Powell Avenue substation. But none are used in the Gadsden and Tampa installations.

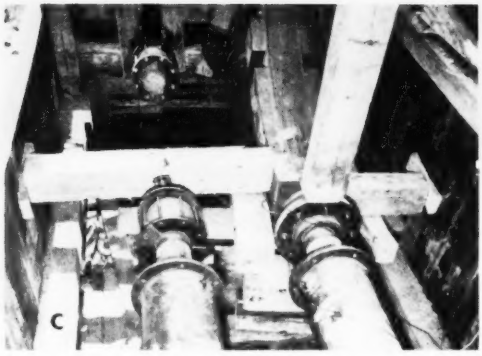
While Georgia Power (EW, Apr 26 and May 10, 1947) has its spreader heads below ground, Tampa and Birmingham locate them above ground. There is difference of opinion on placing a concrete protection above the pipe. While this form of protection will induce caution by pick and shovel gangs, it has little effect when heavy excavating machinery is used, as recently was the case in Atlanta. Another factor is the use of semi-stop joints; Atlanta uses them but Tampa does not.

The Gadsden installation is the first direct connection of the cable to the transformer. Gadsden has one air-driven and one electric pump to maintain oil pressure, the air-driven pump being a new feature. Georgia Power has two electric operated pumps, and Tampa Electric Co has the same number.

Alabama Power Co

Since 1935, Gadsden has been a heavy distribution point on the Alabama Power Co system. It has one of the oldest generating plants on the system and the substation supplies approximately 60,000 kva at 46 kv. Also, the substation serves as the terminal for high capacity 154/110-kv inter-connection with TVA, an important 110-kv connection with Georgia Power, and two 110-kv lines from the Anniston and Jackson Shoals area connection to the company's hydro system.

E. R. Coulbourn, chief electrical engineer of Alabama Power Co, said that present load and anticipated growth in the immediate future indicated Gadsden as the logical site for



HOW TAMPA ELECTRIC does it: (A) Mobile crane handles two pipes at a time; (B) drag-line crane bends pipe; (C) splicing pit, showing splicing sleeve and temporary caps on pipes; (D) cable pulled in by special winch and rig

a proposed 120,000-kva steam generating plant. The first 60,000-kw unit went into operations recently; the second is due in the near future.

The plant site is about 1,000 ft from the existing transmission substation. Therefore, the 44-kv and 110-kv switching facilities in the existing substation are used. Use of three-winding transformer banks provide transformation between generator and the 110-kv and 46-kv systems. Seven single phase transformers form two banks with one spare unit. Transformers are tap changing under load, each unit rated 26,000 kva at 13.2 kv; 20,000 kva at 46 kv and 24,000 kva at 110 kv. To avoid complicated and unsightly overhead buses and connections the transformers are connected to the existing substation by two 400-Mcm, 110-kv, and two 1,250-Mcm, 46-kv cables.

The new transformers are located adjacent to the building wall, and the oil-pipe cables, both 110-kv and 46-kv, are terminated in connections on the transformer tanks. This type of cable connection is the first of its kind installed. It is estimated that about $6,000 was saved in the steel structure alone.

At the transformer, cables terminate in bushing chambers operating under 200-psi oil pressure instead of the conventional type bushing. At the substation end, cables terminate in three bushing type potheads, with 97-kv and 40-kv lightning arresters installed on each respective circuit. This type of construction eliminates all 110-kv and 46-kv bus work at the new plant. The open bus is limited to the 13.2-kv generator bus and transformer neutral connections. These transformers are the only electrical equipment installed outside the building of the Gadsden plant.

Control and relay panels for all 110-kv and 46-kv switching facilities are located in the switchboard room at the existing substation. Other than station service and auxiliaries, only the generator breaker is controlled from the new plant. Controls for this breaker and the auxiliaries are on a mechanical-and-electrical control board in the turbine room.

Tap changer control is the only control that can be operated from both the plant and the substation. Transformer taps normally are operated from the substation.

LINING-UP a 6-in. pipe for welding during installation at Birmingham Electric Co

Tampa Electric Company

The double circuit oil-pipe cable installation of the Tampa Electric Co offers certain features and economies peculiar to the loads to be served and maximum reliability desired.

F. C. Cheney, Stone & Webster Engineering Corp. points out that the new 30,000 kw Hookers Point generating station is 2½ miles from the 11th Avenue substation, which is the major substation for the City of Tampa.

Between Hookers Point and 11th Avenue, the territory varies from industrial to residential, is generally fairly thickly settled, and is traversed by main line tracks of the Atlantic Coast Line and Seaboard Air Line Railroads and by arterial highway leading out of Tampa. Since Tampa is subject to violent seasonal winds, sometimes of hurricane force, 69-kv overhead construction through city streets would present problems. For example at railroad crossings it would be difficult to avoid objectionable guying. Also load growth would soon require two additional generating units at Hookers Point.

It was decided to use underground installation with tie at 40,000 kva, or 350 amp at 66 kv. The oil-pipe cable consists of three 350,000 cir mils standard concentric stranded cables with three metallized paper shielding tapes next to the conductor, 0.330 in. paper insulation, one metallized paper and one 0.004 in. non-magnetic metal shielding tape over the insulation, with muslin tape and D shaped armor overall. Cable was fabricated and shipped in approximately 1,600-ft lengths, and the usual temporary protective lead sheath was furnished and stripped as cables were pulled into the pipe.

At first it was planned to install the cable, filling the second pipe with nitrogen gas and maintain a slight pressure. But, load growth was such that the second and third units were authorized for Hookers Point and both cables were installed at the same time.

The Georgia Power oil-pipe installation in Atlanta had a maximum difference of elevation of about 160 ft, and all joints are of the semistop type, located in manholes. At Tampa, flat terrain and ground water conditions made manhole construction expensive and undesirable, so manholes and semistop joints are omitted. Splices are made in temporary splicing pits and buried after completion. Thus, Tampa has a continuous pipe.

A 10-in. inside diameter sleeve is used for splices, with a special steel reducer ring or bushing at each pipe end between sleeve and pipe, which has a relieved inner end similar to a duct bell-end. A drain plug and vent plug are provided on each sleeve. A valve was located on the pipe adjacent to each splice for charging pipe with nitrogen, evacuating during the oil filling, and sampling oil after filling. Later the valves were plugged. Steel reducer rings were welded to the pipe and to splicing sleeves, so that the whole line is a continuous welded structure.

Terminations consist of a spreader head, just above ground level, and three copper pipes, each enclosing one cable and leading to the pothead on an elevated steel structure. The riser pipes for the two outside phases are about 15-ft long. The assembly is designed so that grounds at the spreader and at the bottom of each pothead can be readily removed to facilitate periodic testing for continuity of coating.

Pipes are buried a minimum of 36 in. below ground level. A 4-in. cushion of sand was placed in the bottom of the trench, and a covering of one foot of well tamped sand laid over the pipes. Backfilling was done with a bulldozer. No concrete or creosoted timber protective mat was used over the pipe.

Two main line and four siding railroad crossings were made without interruption to traffic or excavation across railroad rights-of-way by jacking 12-in. pipe sleeves through from one side to the other. The space between pipe and sleeve was filled to provide thermal transmission characteristics similar to those of the soil surrounding adjacent sections of the pipe.

Laying of pipe, backfilling and street surfacing, except at splicing points, was completed in 90 working days from the start of excavation. Two welders using electric arcs averaged 16 pipe welds per day. Welds were tested under pressure with water trough, and were hammer tested. All bends were made in the field; 90-deg turns were bent cold to a 40-ft radius without appreciable damage to pipe or coating.

The three cables were pulled in together. Pulling tension averaged about 3,000 lb and never exceeded 4,500 lb. During splicing operations, rubber stoppers were used at pipe ends and nitrogen fed into the pipes. Each three-phase splice was completed by continuous work; on completion, sleeves were made up and welded into place.

The new unit at Hookers Point was ready before the 66-kv transformer and the 115-kv potheads for the cables were available. Temporary 23-kv potheads were installed, and operated at 13.8 kv. Later 115-kv terminals were installed and one line put in operation at 66 kv.

Birmingham Electric Co

The Birmingham Electric Co installation is a double-circuit 110-kv cable from the built-up section of the city into the downtown Powell Avenue substation, a distance of 1¾ miles. An overhead system extends another 2¼ miles to connect with the 110-kv buses at the Magella feed-in substation.

Powell Avenue substation is a new 60,000/80,000-kva primary just south of the business district and near the center of the city. It is centrally located between the four existing primary substations where energy is received from Alabama Powers Co at 110 kv and stepped down to 13.8 kv for distribution.

There are two 30,000/40,000-kva, 110-13.8 kv, delta-wye connected three phase transformers with automatic tap changing under load in the substation and normally one cable will feed each transformer with both high and low side bus tie breakers open. However, with one 110-kv cable out of service, the other will have capacity to carry a maximum load of 80,000 kva at 75% power factor. Oil pressure equipment for the 110-kv circuits maintain 200 psi on the 13.8-kv circuits.

The two 6-in. outside diameter seamless steel pipes for the 110-kv circuits were laid in the same trench with a minimum spacing of 18 in. between centers. The depth of the trench varied from 3½ to 14 ft. For a large part of the route the pipe was buried under the parkway between the sidewalk and the curb, and in most cases below the water, gas and sewer connections. After laying, the pipe was covered with three or four inches of good clay—free from slag, stones or cinders, after which a 3-in. slab of concrete was poured for protection during future excavations that might be made.

Each 110-kv circuit consists of three 400-Mcm copper cables. Each 13.8-kv circuit consists of two pipes, each with six 600-Mcm copper cables. The 13.8-kv circuits are about 700-ft long and have no splices. The 110-kv circuits consist of five sections with cable from 1,505-ft to 2,328-ft in length. There are only four manholes, 7 x 12 ft with a minimum height of 6 ft. Each manhole has room for two splices. The trifucating spreader head at the terminals are located above ground so that a manhole is not required.

P. S. Timberlake, electrical engineer for Birmingham Electric who engineered the job, said that a 3-in. red concrete mat was poured about 3-in. above the pipes to help protect the somastic coating during future excavations across the route. He pointed out that 100-ft radius bends were used wherever possible—all made in the field. Factory bends were used at the terminals only. Those installed underground were coated with high melting temperature waterworks enamel and three wraps of saturated asbestos felt. These bends were encased in concrete to form the pipe anchors.

An Aerial Cable Secondary Network

(Continued from page 61)

Somewhere between 10 and 15 min are required to pass the spinner around the pole. While the possibility of eliminating the need for removing the spinner at each pole has been investigated, we have not been able to solve the problem. In our opinion, any device that could be used to support the messenger and cable, away from the pole, would require at least that much time to install and remove. In addition if the lashing wire is spun continuously on the cable past the pole, there is a possibility that the fixture supporting the messenger will chafe the cable insulation. A solution to this problem would be most welcome.

A copper cable hanger is installed about 30 in. each way from the pole to provide additional bearing area for the cable where it dips down 24 to 30 in. to a pole-mounted support containing three 1,500 amp Moles. These Moles have an opening at each end for secondary cable connection and four openings facing upward into which 4/0 or larger services are connected through Molimiters. Underneath the Mole there are four openings facing downward into which are connected the supply leads from transformers. All openings not used at this time are closed with rubber plugs for future use.

All customer services of 4/0 or larger size are brought directly to a Mole outlet through a Molimiter of size corresponding to the service conductor. At locations where a number of small customer services radiate from a singe H-frame, a run of 500,000 cir mils or 350,000 cir mils cable is run from the Mole up to a timber near the center of the frame and these smaller services are connected to it.

Preliminary estimates of the material and labor costs for installing this cable are $3.70 per ft. Estimated cost of installing three 500,000 cir mils weather-proof copper wires and a 4/0 copper neutral is $3.50 per ft. However three 750,000 cir mils weather-proof open wires with a 4/0 copper neutral were installed so as to have the same voltage drop as the 500,000 cir mils aerial cable, the cost would be $5.00 per ft.

J. L. Callahan, RCA Laboratories; D. I. Cone, Pacific Telephone Co; retiring AIEE President, Everett S. Lee, General Electric Co; J. M. Flanigen, Georgia Power Co and F. O. McMillan, Oregon State College (all AIEE officers or directors)

Past AIEE President J. Elmer Housley, Aluminum Co of America; R. T. Henry, Buffalo Niagara Electric Co; E. B. Robertson, Elgin B. Robertson Co; D. E. Allen, Anaconda Wire & Cable Co and Victor Siegfried, American Steel & Wire Co

AIEE Reports Utility Expansion

CRITICAL REVIEW of power system equipment and its reliable functioning on expanding utility systems marked the Summer General Meeting of the AIEE at Swampscott, Mass., during the June 20-24 week with 1550 participating. Significant technical topics were the ascendancy of the sub-transmission, pipe-type cable systems and primary networks. Loss-of-field protection was another prominent topic.

In the field of institute policy and administration, the study of sucessful engineering personalities was suggested by Donald B. Prentice, President Emeritus of Rose Polytechnic Institute, as a fruitful field of activity for the Engineer's Council for Professional Development. In discussing new objectives in the accrediting of engineers Titus LeClair, proposed that more careful consideration be given borderline cases. E. W. Davis stressed the need for still more attention to English, report writing, public speaking, economics and business law. The MIT cooperative program, involving three years of preparatory work before entering upon undergraduate study, was advanced as one solution to the need for more general education for engineers. Seventy-five students are now enrolled in this program.

Development of an overall association for engineers may be from five to 40 years away. This prediction was made by J. F. Fairman during a discussion of the proposal that AIEE decide on whether or not to close the door to activities in civic and legislative matters.

At the Section Delegates Conference, revision of "prize paper rules" was unanimously approved. The devision called for adding many new awards. The full recommendation was sent to the Planning and Coordination Committee for further action.

INSULATED CONDUCTORS

Transformer Manholes and Vaults — Design and Ventilation. L. F. Porter, *Consolidated Edison Co of New York, Inc.*

Basic considerations in the design and ventilation of transformer manholes and transformer vaults required to supply secondary network load.

Temperature Rise of Cables in A Duct Bank. J. H. Neher, *Philadelphia Electric Co.*

Presents basis for a theoretical method of calculating temperature rise of cables in duct in terms of geometry of duct bank and effective thermal resistivity of the earth. Presents factual data in support of theory.

A-C Resistance of Segmental Cables In Steel Pipe. L. Meyerhoff and G. S. Eager, Jr, *General Cable Corp.*

Findings of study of a-c resistance of a compact segmental conductor in air and steel pipe in various configurations. Separation made of losses occurring in conductor, outer shield structure and steel pipe. Component losses compared with accepted derived formulas.

69-Kv Pipe-Type Cable Circuits in Philadelphia. A. H. Kidder and G. S. Van Antwerp, *Philadelphia Electric Co.*

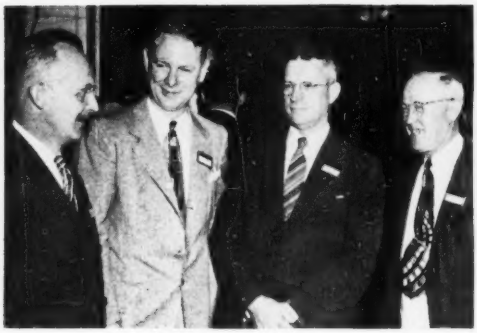
Critical comparison of performance of 69-kv gas pipe-type and oil pipe-type cable on Philadelphia Electric Co system. Dependability of oil pipe-type cable confirmed. High losses noted.

Observations on Recent Developments and the Trends in High Voltage Cable Transmission. P. H. Chase, *Philadelphia Electric Co.*

A statement of the current problems and possible future trends in high tension underground transmission. Calls attention being given power losses of pipe-type cables long over-due. Utilization of polyethelene extruded over conductor instead of wrapped impregnated paper tapes cited as worth examination.

W. B. Morton, Pennsylvania Power & Light Co, in discussing vault design warned that the high reliability of dry-type transformers should not lull engineers into a false sense of security. He reported an instance of a vault explosion that resulted from the high-temperature liberation of volatile gases from a dry-type transformer insulation caused by a short circuit at the secondary terminals.

The particularly able summary of trends and developments in high voltage cable transmission by Chase drew uniformly high and widespread praise from discussers. K. S. Wyatt, Phelps Dodge, saw little possibility of price reductions in present cable systems. Such reduction must come, he said, from developments of a radical nature such as a water-cooled



D. R. Pattison, Pennsylvania Electric Co; A. A. Johnson, Westinghouse Electric Corp; B. M. Jones, Duquesne Light Co and H. A. P. Langstaff, West Penn Power Co

H. H. Rudd, R & IE; R. E. Murphy, ITE Circuit Breaker Co; E. W. Allen, Southwestern Bell Telephone Co and R. S. Matthews, W. N. Matthews Co

neoprene-jacketed cable possibly in a porous non-metallic duct. A. D. Pettee, General Cable, felt that present pipe and joint constructions would permit progress to higher gas and oil pressures in cable systems but that improvement in terminal facilities will be a necessary prerequisite.

Experimental data on temperature rise of cables in concrete duct runs in air, presented by F. V. Smith, Sargent & Lundy, were in substantial agreement with Neher's determination of thermal resistance between cable and duct wall. R. J. Wiseman, Okonite, while praising Neher's contribution, pointed to a need for agreement among cable engineers on a value of effective thermal resistivity for earth. F. H. Bullard, General Electric, challenged Neher's use of the principle of superposition in making mathematical approximations involving radiation and convection where cause and effect do not vary in direct proportion. He felt also that idle ducts in a bank would detract from the accuracy of Neher's relative position factors.

G. B. Shanklin, General Electric, was not in accord with conclusions of the Kidder-Van Antwerp paper that, for the same load and copper temperature, pipe-type and cable in duct systems should have equal conductor size. Shanklin felt a 25-30% larger conductor was indicated for pipe-type systems. However, he believed that oil-pipe and gas-pipe cable conductors should be of equal size. W. A. Del Mar, Phelps-Dodge, saw danger of damage to insulations in the author's aim to secure to a copper temperature of 100 C. F. M. Hull, Detroit Edison, however, reported successful operations of gas-pipe cable system for 116 days at 100 C copper temperature with cyclic loading. He said all new lines are being built to operate at 100 C but indicated that a change has been made from a solder to a pressure connector to overcome difficulties experienced with extrusion of solder. C. T. Hatcher, Consolidated Edison Co of N. Y., reported that the New York utility has installed as much as 10 miles of pipe-type cable with 20-semi-stop joints with one pumping plant. He questioned the author's specification of a 4½ mile limit.

R. J. Wiseman, Okonite, indicated that simplified formulas for a-c resistance of segmental cable gave values "close-enough" to Meyerhoff values for practical purposes. A. H. Kidder, Philadelphia Electric, concluded from Meyerhoff's Tables 10, 15 and 16 that the expense of triplexing cables may be more than justified by the reduction of losses compared with cradle configuration.

PRIMARY NETWORK SYSTEMS

Improvements to Oklahoma City Primary Network. Bryce Brady, *Oklahoma Gas & Electric Co.*

Expansion of an existing 4.16-kv primary network in Oklahoma City found more economical than conversion of a radial plan of primary distribution. Quality of service little different for two types of systems.

Primary Networks On the Duquesne Light Company System. W. P. Holben and J. E. Lange, Duquesne Light Co.

Test results and operating experience confirm effectiveness of inverse reactive compensation to provide satisfactory division of load between network units, improve stability and reduce circulating currents. An 18-year performance record provides evidence of high service reliability.

Design and Experience With 4-Kv Network Systems In the Washington Area. W. J. Lank, *Potomac Electric Power Co.*

A decade of experience with primary networks in the Washington area points four conclusions: Primary network is less costly than new radial 4-kv stations where load is uniformly distributed, construction to supply new loads is simpler and more flexible, operating reliability is improved and voltage regulation is better.

Primary Network Installations On the Boston Edison System, L. J. Weed, *Boston Edison Co.*

Describes three primary network installations on Boston system serving total load of 93,000 kva. While primary network is reliable economical way to relieve existing overloaded radial system, there may be areas where double ended unit radial substations will provide more economical means of furnishing necessary relief, authors report.

Danger of creating very high loadings at points on a primary network due to the tendency of a network to pick up dropped load without indication after a fault burns clear, was pointed out by Leonard Olmsted, Duquesne Light. A. H. Kidder said that experience had been favorable on the Philadelphia Electric system with a simple form of networking using 1,500 to 2,000-kva units, simple reverse power protection and uncomplicated voltage regulation. Heavy reliance was placed on burning faults clear rather than isolating them by switching.

L. J. Wood, Boston Edison, found missing from rural areas the element that makes urban networks attractive ie minimum extension of circuits to form networks. Lank readily conceded that it had been necessary

G. S. Eager, General Cable Co; J. H. Neher, Philadelphia Electric Co; C. T. Hatcher, Consolidated Edison Co of N Y; L. Meyerhoff, General Cable Corp; A. H. Kidder, Philadelphia Electric Co; L. F. Hickernell, Anaconda Wire & Cable Co; P. H. Chase, Philadelphia Electric;

G. M. Ambrust, Commonwealth Edison Co and R. J. Wiseman, Okonite (Picture above right) W. F. Dunkle, Pennsylvania Power & Light Co; L. W. Smith and F. C. Doble, both of the Doble Engineering Co

to extend 13.2-kv network feeders in some cases but he said that 4-kv circuits had been generally available. C. A. Vorney, Boston Edison, said on the Boston network loads of 2,000 to 2,500 kva are being carried by transformers in underground vaults that are presumably less costly than the "houses" used on the Washington system to disguise substations. Lank disclosed that in residential Washington area such "houses" have risen from $4,500 in 1939 to about $16,000 to $20,000 at present. This includes land. Lank said, observing that from a real estate standpoint Washington substations seemingly are "built over a gold mine."

SUBSTATIONS

Aluminum Alloy Substation Structures. A. M. Baker, *Pennsylvania Electric Co.*

Initial installation (Electrical World Aug 3, 1946) followed by two others. First cost high but offset by reduced upkeep.

Application of the "Multiplex" Scheme at Urban Distribution Substations in Baltimore. M. Mortara, *Consolidated Gas Electric Light & Power Co.*

Ring connection of "building blocks" comprising transformers, two feeder breakers and tie breaker (normally open).

Automatic Grounding and Air Break Switches for Protection of Transformer Stations. E. A. Ricker, *Hydro-Electric Power Commission, Toronto.*

Thirty-three stations totalling 643,500 kva afford 260 switch-years experience showing 13 troubles with spring-operated grounding switches, 14 with the air break and 22 with the controls.

A New Two-Signal Synchronous Supervisory Control System. W. A. Derr, *Westinghouse Electric Corp.*

Suitable for telephone or microwave channel. Employs two different types of signals from both the controlling and controlled stations.

In amplification of his paper Baker said the 33,000 lb of aluminum alloy cost about $25,000 whereas 94,000 lb of steel would have cost only $14,000, making the overall aluminum installation cost 10 to 15% more. In answer to a query by D. E. Alexander (Victor Insulator) it was stated that grounding was effected by a 1-in. gap around a single-disk insulator in the aerial ground wire, the gap being grounded at an adjoining pole and tied to the A-frame structure. G. B. Carlisle on the cost issue said R&IE had not been able to buy structural aluminum for as low as twice the price of steel.

Comment by W. R. Brownlee (Commonwealth & Southern) on the Ricker paper called attention to AIEE committee surveys of USA practice; one, two years ago, showed over half the companies preferring transfer tripping. A later survey has shown a more equal division for stations without high voltage switching. He asked the time of operation of the spring-operated grounding switch, feeling this was important in comparing with alternative measures and suggesting that straight-line might speed up the operation of line grounding switches.

TRANSFORMERS

Economic Loading of a Transformer System. D. L. Levine and H. E. Smith, both *Commonwealth Edison Co.*

Dominant factors analyzed independently to substantiate program of raising average loading of distribution transformers with 19% saving of 400,000 kva in installed capacity.

Heating of Transformers Under Short-Circuit Conditions. V. M. Montsinger and G. H. Halsey, both *General Electric Co.*

Insulation heat absorption negligible; aging occurs mostly during cooling period; allowable temperature limit should depend on rate of cooling.

Standardization of Reactor Ratings. F. H. Kierstead and J. L. Thomason, both *General Electric Co.*

Suggests a schedule of ratings recognizing the design and economic factors involved.

Transformer Audio Noise Problems on an Electric Power System. C. S. Murray, *Consolidated Edison Co of New York, Inc.*

General discussion of criteria and measurements concludes with citation of effectiveness of barriers, total enclosure, separate foundations, etc.

Alleviation of transformer noise by apt design rather than by such subsequent correctives as sound enclosures was advocated by several utility enginers in a concerted discussion of the highly regarded paper by C. S. Murray. First to express belief that noise allowance in the standard is too high was J. A. Adams of Philadelphia Electric. At this point a manufacturer's engineer estimated that a 10 db noise reduction might increase weight 50% and cost 25%. Sound-proof enclosures, however, are costly and of dubious efficacy in connection with large transformers said J. A. Ray of Pennsylvania Water & Power. Nevertheless Detroit Edison, according to A. P. Fugill added that some present transformers are noisier than some bought before the war and the intimation was that the cause might reside in the efforts since made to reduce weight and size.

The same size-reduction program prompted W. R. Brownlee and J. A.

(Left picture) W. B. Morton, Pennsylvania Power & Light Co with S. H. Mortensen, Allis Chalmers Mfg Co. (Center picture) H. N. Muller, Jr, Westinghouse Electric Co and incoming AIEE President J. F. Fairman, Consolidated Edison Co of N. Y. Mr. Fairman was installed in office at the Summer General Meeting. (Right picture) W. Gross, American Gas & Electric Co and S. B. Crary, General Electric Co, newly-designated chairman and vice-chairman of the AIEE Power Transmission & Distribution Committee

Elzi of Commonwealth & Southern in comment on the Levine-Smith paper to assert that the unreduced transformer is not necessarily the higher cost unit if increased reactance and kilovar losses are counted. These items if appropriately evaluated can add more than 15% to the cost of a self-cooled 73 Mva unit to switch it to a forced-oil, forced-air design. Energy losses are similarly greater. Their conclusion was that a review of basic transformer design proportions is in order if a better economic balance of fixed and operating charges is to be achieved consistently with retained life.

Operating guide data are sometimes taken too religiously in the opinion of J. W. Butler (General Electric). He cited a survey which indicated that over a 25-year period the cumulative failures of transformers for all causes was less than 3%. Therefore operators could well think of "guide" curves as wide bands rather than narrow lines. Levine dissented, asserting that the engineer must establish the line on the best information leaving the wide-banding decision to the economic executive.

V. V. Mason told briefly of a loss-of-life cross section paper revised by Hydro Electric Power Commission engineers to facilitate calculations of life-loss for transformers under varying degrees of overloading.

T&D AND SYSTEM ENGINEERING

Planned Development of a Power System. N. N. Smeloff, *Pennsylvania Power and Light Co.*

The present development of the system of the Pennsylvania Power & Light Co analyzed in the light of "economic workability" of projects in the continuing expansion of larger loads. Guiding principles enumerated. Philosophy detailed.

A 66-Kv Sub-Transmission Plan for A Metropolitan Area. K. M. Smith and E. L. Michelson, *Commonwealth Edison Co.*

New system utilizing 66-kv as sub-transmission used to provide for load expansion in Chicago. Reasons are described and some system details discussed. Higher load densities, increased transmission from rim to center of city, cost of extending existing facilities and availability of factory assembled switchgear were factors considered.

Comparative Performance Records—Steel and Wood Transmission Lines. C. A. Booker, *New England Power Service Co.*

In New England territory near immunity to lightning is had when line design incorporates 2,500 to 3,000 kv of impulse insulations, corresponding clearances and one or more ground wires. Lines over 110-kv meeting these requirements at fair cost can be built using impulse properties of wood.

Stationary Networks and Transmission Lines Along Uniformly Rotating Reference Frames. Gabriel Kron, *General Electric Co.*

Reports first of a series of studies on physical and mathematical analysis of the steady-state stability of conventional and long-distance transmission systems as influenced by the presence of voltage regulators and other control devices.

Overcurrent Investigation On A Rural Distribution System. G. F. Lincks, General Electric Co; D. R. Edge, Graybar Electric Co; W. C. McKinley, Central Electric Cooperative, Inc; and J. H. Leh, *General Electric Co.*

Report of a four-year overcurrent investigation on a rural system covering 2400 sq mi shows fuses and locked-closed reclosers coordinated for overlapping protection will: reduce fault locating time 60%, reduce hours outage 70-90% over reclosers alone, cut cost of restoration 28.5%.

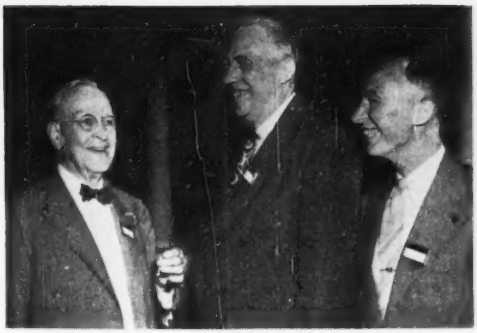
Advances in Technique of Lightning Measurements. Theodore Brownlee, *General Electric Co.*

Improved measuring equipment and refinements of technique used in increasing number and accuracy of lightning records taken in four-year study of rural distribution study. Special shunts matched to expected currents, improved means of initiating oscillographs, refinements in accuracy and speed of magnetic link calibrations are among developments.

Short Circuit Currents and Recovery Voltages on Rural Distribution Systems. W. H. Eason, I. B. Johnson, J. W. Kalb, *General Electric Co* and H. A. Peterson, *University of Wisconsin.*

First published data concerning measured values of recovery transient voltages on a rural distribution system and their correlation with transient analyzer measurements. Results show that system complexity and load are important factors in determining recovery transient characteristics and should be taken into account in analyzer studies.

Active and generally-favorable discussion marked the Smith-Michelson paper on 66-kv sub-transmission. J. J. Tessar, Cleveland Electric Illuminating Co, observed that under today's load conditions city sub-transmission is becoming increasingly effective and 12-kv cable circuits in the streets less effective. A suggestion by V. E. Hill, Duquesne Light, that direct transformation from 66 to 4-kv would eliminate the intermediate 12-kv transformation led Michelson to reply that he would rather eliminate the 12 to 4-kv transformation and use 12-kv as a future distribution voltage. B. M. Jones, Duquesne Light, reported that congestion of 12-kv circuits on the Pittsburgh system was leading his company to consider several subtransmission schemes to achieve relief. Both D. K. Blake and C. A. Woodrow, General Electric, unlike the authors, found the 66,000-kva substation size in Chicago "large" instead of "small". Woodrow suggested that a greater number of smaller (40 Mva) substations with



Irving Moultrop, Boston Edison Co, retired; W. W. Edson, Boston Edison Co and M. Stadtfeld, Westinghouse Electric Corp

M. D. Hooven, Public Service Electric & Gas Co; T. G. Le Clair, Commonwealth Edison Co and J. C. Woods, Commonwealth Edison Co

reduced spacing would be attractive economically. However, the authors noted that difficulties in securing real estate made such a course impracticable.

A. A. Johnson, Westinghouse, speculated that in the future growth of 12-kv systems can be stopped by use of 66-kv and that a voltage intermediate between the two may eventually eliminate 12-kv. The authors pointed out that 12-kv substations won't be replaced since logical system development points to 12-kv distribution.

G. F. Lincks, General Electric, commenting on the Eason-Johnson-Kalb-Peterson paper said there is great need today for determining rates of rise and magnitude of recovery voltages on different distribution systems. Test circuits can then be standardized and interrupting ratings of fuse cutouts and reclosers fitted more closely to actual service conditions.

RELAYS

Relaying of Transmission Lines From the New Sunbury Generating Station. H. H. Green, J. A. G. Oewel and O. Ramsaur, *Pennsylvania Power & Light Co.*

Functional requirements of relaying in the development of the transmission outlet for the initial 150 Mw installation at Sunbury. Special problems encountered, kinds of relaying selected to meet requirements and solve these problems.

Graphical Methods of Estimating Performance of Distance Relays During Faults and Power Swings. A. R. van C. Warrington, *General Electric Co.*

A quick way of determining what impedances phase and ground distance relays measure during fault and swing conditions. Method is graphical, requires only ruler and protractor and knowledge of positive and zero sequence impedances.

Considerable difference of opinion over the function of loss of field protection for generators grew out of discussion of the conference paper by G. B. Miller, Duquesne Light Co. summarizing practice among Pennsylvania utilities. Miller concluded that for smaller utility systems of 33 to 1,410 Mw capacity, absence of loss-of-field protection is not serious. For larger metropolitan systems field failure relays were found to be necessary. Loss-of-field on large machines operating at light loads and high power factor may produce instability on such systems. S. B. Crary, General Electric, noted that metropolitan systems have been reluctant to use voltage regulators; but that when they are installed, need for loss of field protection—to avoid instability—largely disappears. Principal purpose of such protection is to protect the machine. Crary believed. E. L. Michelson, Commonwealth Edison, said that light-load, high-power-factor tests in Chicago showed that loss of field on a 150,000-kw machine could endanger system stability. This was a major factor in providing protection for all machines over 100,000 kw on the Chicago system. Earl Wild, also Commonwealth Edison, felt that it was courting trouble to let large machines stay on the line without voltage regulators. While he favored installation of the relays on the Chicago system, there was no need for *both* regulators and loss of field relays.

C. R. Mason, General Electric, described a single-phase distance type "mho" relay that responds to relations between a-c current and voltage at generator terminals to distinguish between loss of excitation and other normal or abnormal operating conditions. E. F. Dissmeyer, Commonwealth & Southern Corp, discussing this conference paper, said that with all factors considered, loss of excitation protection may not only be unnecessary but may in many cases reduce reliability.

C. E. Asbury, Commonwealth & Southern, questioned the use of carrier relaying on transmission lines associated with the new Sunbury generating station as reported by Green, Oewell and Ramsaur. Short length of some lines would indicate that pilot-wire relaying was a possibility. In closure the authors said that the greater speed of clearing with carrier and the avoidance of leased lines were major factors in the selection of carrier.

CARRIER CURRENT

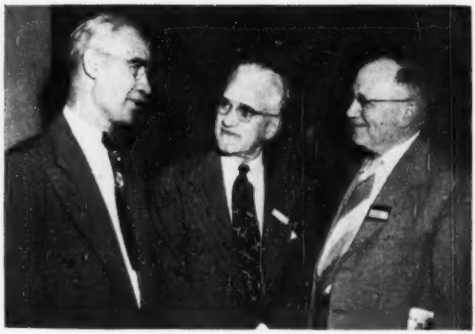
Loss Measurements Made On Underground-Cable Overhead-Conductor 132 Kv Transmission Line at Carrier Current Frequencies. H. A. Cornelius and B. Wade Storer both *Commonwealth Edison Co.*

Of 37 miles 5.8 miles is 600 Mcm oil filled paper cable. For 50-150 kc the cable characteristic impedance is 42.5 to 28.5 ohms and attenuation 25 to 53 db. Satisfactory reliability is expected.

Power Line Carrier for Relaying and Joint Usage—Part I. G. W. Hampe and B. W. Storer, both *Commonwealth Edison Co.*

Sharing of carrier time can mean inefficient uneconomic use of carrier energy and spectrum space if relaying hampers use for other functions. Basic considerations analyzed.

Increased use of carrier may dictate higher degree of selectivity of receivers according to H. W. Lensner of Westinghouse who added that there is no fully established method of predicting carrier attenuation. There was also the suggestion that analog computers may promise an



A. L. O'Banion, City of Boston; M. J. Lowenberg, Stone & Webster; E. W. Davis, Simplex Wire & Cable Co and General Chairman of the Summer General Meeting Committee with F. S. Bacon, Rockbestos Products Corp. (Right picture) J. B. Hodtum, Allis Chalmers Mfg Co; E. S. Fields, Cincinnati Gas & Electric Co; and Harold Cole, Detroit Edison Co

answer to some problems posed by carrier. C. E. Asbury (Commonwealth & Southern) intimated that dual and triple-functioning may often be created to justify adoption of carrier and that increasing complication of filters may become necessary to segregate the different frequencies used for the different functions.

The portion of the spectrum recommended for a low cost radio link with few channels and relay points appears to be in the 952-960 Mc region said W. E. Sutter and R. V. Rector (General Electric) in one of four conference papers. Small wattage and beam reflectors are an advantage of 2,000 Mc. A second conference paper gave information about the 2,000-Mc Federal Telecommunication system being installed on the Bonneville network.

Pennsylvania Electric has installed a 950-Mc two-way Westinghouse system capable of affording four voice channels and 30 telemetering channels with a 20 x 20-ft. chicken-wire reflector to bend around a high elevation. D. R. Pattison's brief conference paper will be expanded in a forthcoming article in ELECTRICAL WORLD. Equipment details were presented in a fourth conference paper by M. H. Wood and F. B. Gunter of Westinghouse.

ELECTRIC HEATING

Characteristics of Arcs Between Moving Electrodes. W. B. Kouwenhoven and T. B. Jones, both *Johns Hopkins University*.

Anode spots studied by means of 1-in. tape as moving electrode. Effect of current density evaluated.

In addition to the formal paper, four conference presentations were: High Temperature Ceramic Insulations, by Hans Thurnauer, American Lava Corp, Chattanooga, Tenn, who compiled basic data on ceramics, including melting points, thermal endurance data, dielectric properties and limitations. Electrode Type Steam Boilers and Water Heaters by S. A. Williams, of Bastian & Allen, London, England, reviewed advantages of low-voltage electrode type boilers. Heat is generated within the water itself; compactness and gradual regulation of load valuable. Temperature Measurement for Infrared Heating Processes, by W. F. Hickes, the Foxboro Co, Foxboro, Mass., discussed equipment for measuring and recording data from infrared ovens. Some Problems in Measurement of Low-Intensity Fields at Ultra High Frequencies, an AIEE subcommittee report, prepared by C. W. Frick, General Electric Co, indicated the desirability of developing equipment for measuring radiations above 200 Mc.

Progress in reducing or eliminating interference of radiations from high-frequency heating equipment is receiving close attention. Measuring equipment of much higher range than formerly is needed. Research in the levels of 20,000 to 30,000 Mc is desirable. Continuous shielding is a "must". Double shields are required in few cases. Undistorted wave forms aid in reducing interference. Advances in infrared oven operating measurements presage better understanding of paint requirements and applications. Use of trailing cables is a minor disadvantage, in view of their generally temporary application. Dipole antennas are applicable from 18 to 2,000 Mc.

INSTRUMENTS

A Thermal Converter for Telemetering and Totalizing. W. C. Downing, Jr., *Sangamo Electric Co.*

Multiple-winding voltage and current transformers replace supplementary transformers to isolate thermocouple currents for direct contact of heaters and thermocouples.

Heat Flow Ratio as a Design Parameter in Thermal Demand Meters. J. S. Nelson, *General Electric Co.*

Heat escape from bimetallic springs can be controlled independently of other design factors. Mathematical analysis.

A New Expanded Scale A.C. Voltmeter. N. P. Millar, *General Electric Co.*

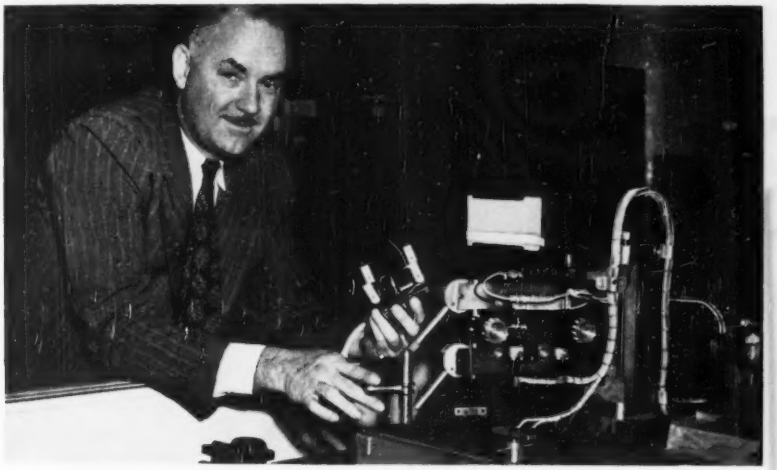
Excitation milliamperes to saturable reactor give expanded scale with good torque gradient and advantage of retained zero. Arc for 90-130-v is 220 deg on 120-v, 250 deg instrument.

A New Instrument Mechanism. A. Stimson, F. B. Jennings, C. W. McCarthy, all *General Electric Co.*

Judicious utilization of Alnico in inverted location results in reductions of 75% in weight and 68% in volume with improved shielding and scale distribution.

Degree of usefulness for the volt-squared form of thermal converter in the face of availability of the watt converter was questioned by P. A. Borden of the Bristol Co. He also reminded the audience of the Lincoln device and the thermoverter described earlier and W. Richter of Allis-Chalmers said the Phillips concern of Eindhoven, Holland has used a comparable principle. Borden also raised a query about the internal resistance of the converter and the consequences of fault currents. Downing mentioned 7 ohms as indicative of element resistance.

new *facilities assure*
accuracy and uniformity in
new *I-50 watthour meter!*



This electronically controlled power-factor adjusting device is one of the many pieces of new equipment designed especially for I-50 production. It permits the electromagnet to be accurately lagged before installation in the meter—another assurance of accuracy and uniformity in the I-50.

The I-50 watthour meter is completely new from terminals to cover—and so are the facilities we're using to produce it. We've equipped an entire new plant—from screw drivers to assembly lines—with the most modern equipment for I-50 production.

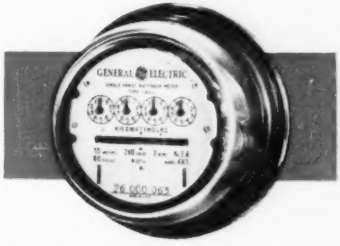
And what are your benefits? With every I-50 order you place, you get a meter with greater sustained accuracy, longer life, and lower maintenance costs than ever before possible. These benefits result from our modern facilities, plus specially trained personnel, rigid quality control, and precision manufacturing techniques.

H. K. Campbell

Superintendent of Meter Manufacturing
Meter and Instrument Divisions
West Lynn, Massachusetts

NEW FEATURES FOR LOWER MAINTENANCE

1. Co-ordinated insulation—for better performance under adverse operating conditions.
2. Magnetically suspended rotating element—to do away with bearing maintenance.
3. Braking magnets die-cast in frame—to assure calibration stability.
4. Current coil molded in butyl and potential coil in polyethylene—for greater insulation and stability.
5. One-piece molded "S" base—to minimize corrosion.



Type I-50, the first completely new watthour meter in 50 years

Place your order for socket- or bottom-connected types with your nearest General Electric representative. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

803-81

GENERAL ELECTRIC

Announces... **an entirely new**

Butyl-

Highest accuracy with continuous operation up to 150% of rated current

Now General Electric announces the first successful application of the butyl-molded technique to instrument transformers. A new compound and a new molding method were developed to make this achievement possible.

The first of the butyl-molded line is the Type JKM-3 indoor current transformer (5000 volts; 10 to 800 amperes).

most revolutionary advance

Butyl results in such advantages as high dielectric strength, excellent heat dissipation, resilient sturdiness, and attractive appearance. It also resists tracking and oxidation. It has been given exacting tests—tests conducted for several years. Proved right in every respect, this butyl line can be termed the most revolutionary advance ever made in the design of dry-type instrument transformers.

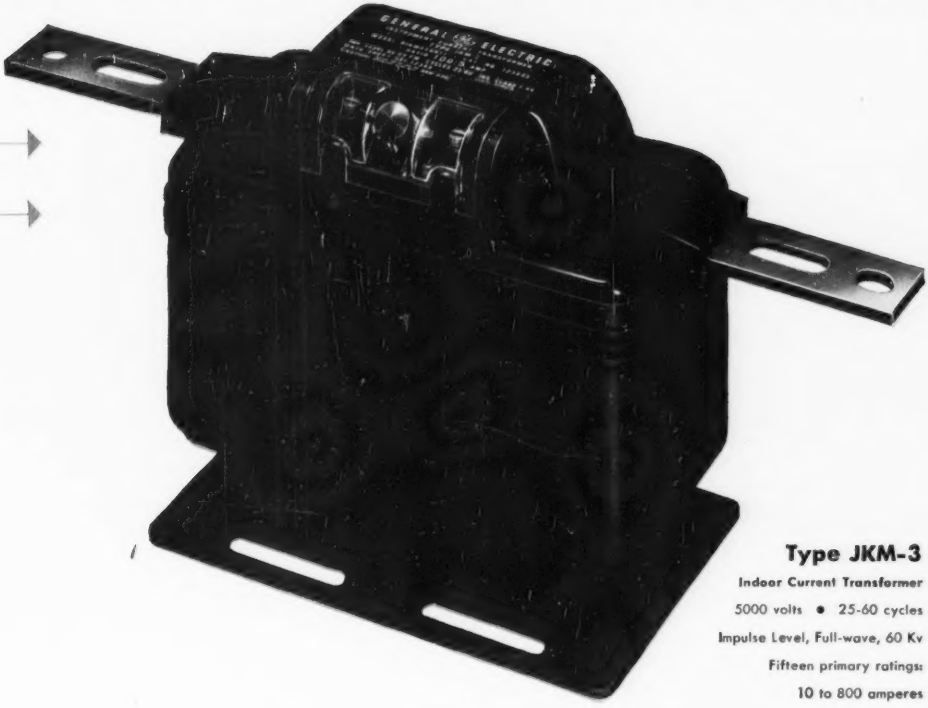
many benefits to users

In addition to butyl, the JKM-3 transformer has a new coil construction . . . a new core construction . . . and other features. Performance highlights are: continuous operation at 150% of rated current . . . accuracy of the highest class . . . and the ability to withstand at least 50% greater surge current.

Complete details on the other new features, and the remarkable performance, of this unusual transformer are described fully in Bulletin GEA-5274. Write for your copy today. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

design of instrument transformer

Molded



Type JKM-3

Indoor Current Transformer

5000 volts • 25-60 cycles

Impulse Level, Full-wave, 60 Kv

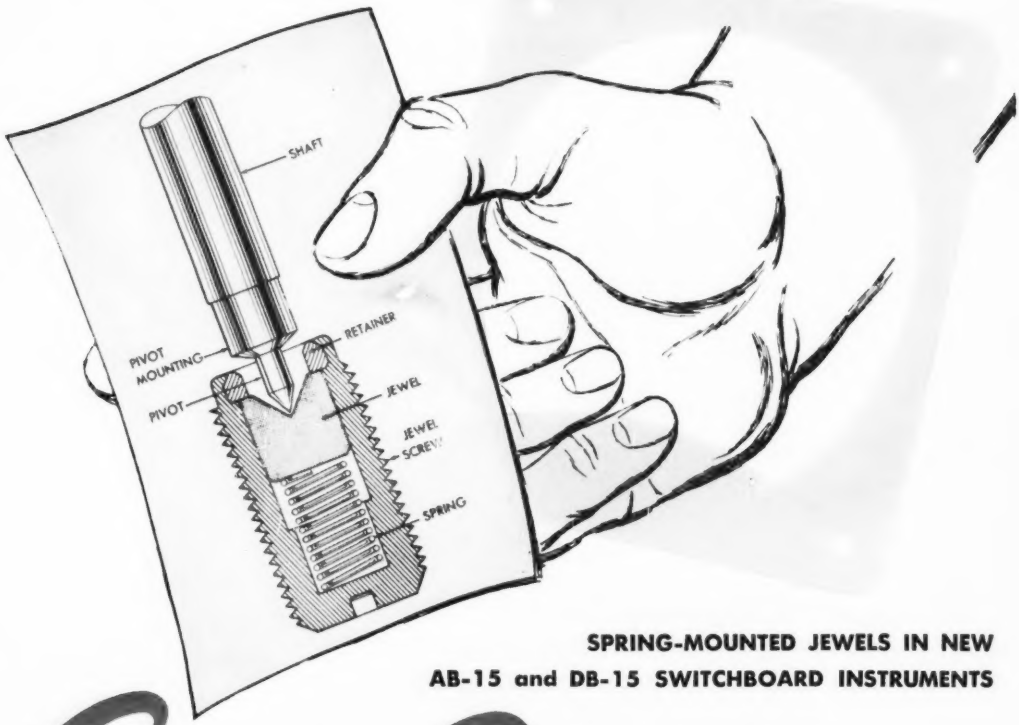
Fifteen primary ratings:

10 to 800 amperes

GENERAL ELECTRIC

6N4-23

engineering gives you



SPRING-MOUNTED JEWELS IN NEW AB-15 and DB-15 SWITCHBOARD INSTRUMENTS

Greater Reliability

The accuracy and excellent performance of this new line of switchboard instruments is guarded by spring-mounted jewels. During handling, transportation, installation, severe overload, or remodeling of panels the jewels are protected. Shocks that might put ordinary instruments out of service are safely absorbed by these special spring mountings.

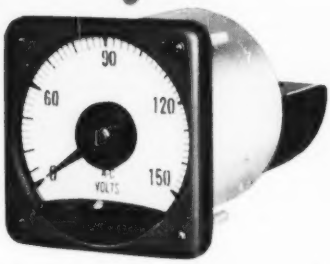
OTHER REASONS FOR INSISTING ON THESE INSTRUMENTS IN YOUR SWITCHBOARDS

Quicker, more accurate reading on the long 7.1-inch scale, spanning 250 degrees, with all figures reading laterally instead of on a curve. Anti-parallax scale and pointer, plus anti-glare glass make reading easier from angles.

Modern streamlined appearance. The attractive black Textolite cover, with circular mask covering the mechanism at center of dial, serves to emphasize scale and pointer. Small size (only 4½ inches square) permits mounting five instruments side by side on a panel only 24 inches wide.

Ease and economy of servicing assured by new "unit" design—entire moving-element assembly can be removed and replaced without disturbing calibration.

Why take less when you can get all these features—plus the many other refinements found in all G-E instruments? Insist on the G-E long scale line when ordering your switchboards, and be sure of the best. **Apparatus Department, General Electric Company, Schenectady 5, N. Y.**



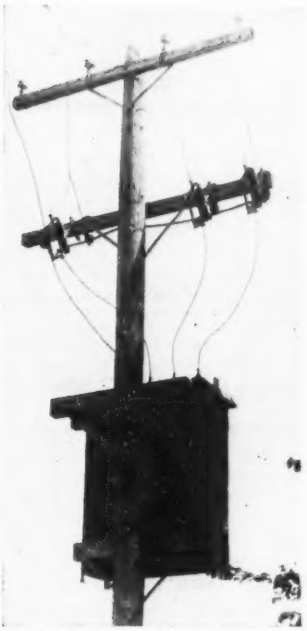
Also available as a-c ammeter, a-c wattmeter, d-c voltmeter, d-c ammeter, temperature indicator, power-factor meter, synchroscope, and frequency meter.

GENERAL ELECTRIC

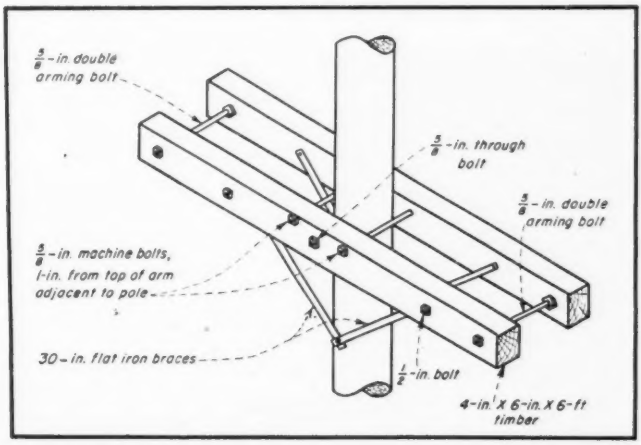
6N2-136

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Wooden Crossarm Mountings Support More Transformer Capacity



180-KVA CAPACITOR BANK supported by the same type of construction used on single-phase transformer installations


⅝-in. double arming bolt
⅝-in. through bolt
⅝-in. double arming bolt
⅝-in. machine bolts, 1-in. from top of arm adjacent to pole
30-in. flat iron braces
½-in. bolt
4-in. X 6-in. X 6-ft timber

MOUNTING DETAILS show in particular the two ⅝-in. machine bolts which are 1-in. from top of arm and adjacent to the pole and which give the added strength. This construction is used for single-phase transformer installations

By SAM H. POLLOCK
Ass't Supt. Overhead Dept
Kansas City Power & Light Co

CROSSARM MOUNTINGS of distribution transformers have been extended up to and including three 100-kva units mainly because, during and since World War II, substantial savings have been made in weights. The table lists weights of old cast iron transformers, prewar transformers, and the 1949 model transformers as taken from well known manufacturers' catalogs. A review of these weights will indicate that a much larger kva transformer, or bank of transformers, can now be hung from crossarms instead of using the more expensive two-pole rack type of construction.

However, one of the difficulties of hanging transformers in this manner has been the tendency of the top of the arm to pull away from the pole. This tendency has been completely eliminated by building the hanger arms as shown in the accompanying drawing. The secret lies in using 4x6-in. timbers in a conventional double-arm assembly and then installing two ⅝-in. bolts 1 in. from the top of the timbers and adjacent to the pole. These two bolts provide the extra strength needed to check the tendency of the top of the timber to pull away from the pole. This type of construction has been used to support single-phase transformers weighing up to 2,250 lb without the use of a platform.

For 3-phase power banks, the same type of construction is used but a 10-ft timber replaces the 6 ft used in single-phase construction. In addition, a 7-ft alley arm brace supports the end of the timbers, and, for transformers weighing 800 lb each, a double kicker arm is used. This type of construction will support up to three transformers, each weighing 1,350 lb.

An early transformer installation supported three 75-kva units, each weighing 1,370 lb. It has been in service three years with no difficulties reported, and upon being dismantled recently, was found in excellent condition.

The capacitor installation illustrated is of a 180-kva unit which weighs 1,300 lb. The installation is a difficult one to hold since the center of gravity is so far out from the pole. In the eleven years that it has been up, it has not been touched and today shows no signs of distress.

This type of construction has been used for several years. Before the war it was limited to three 50-kva

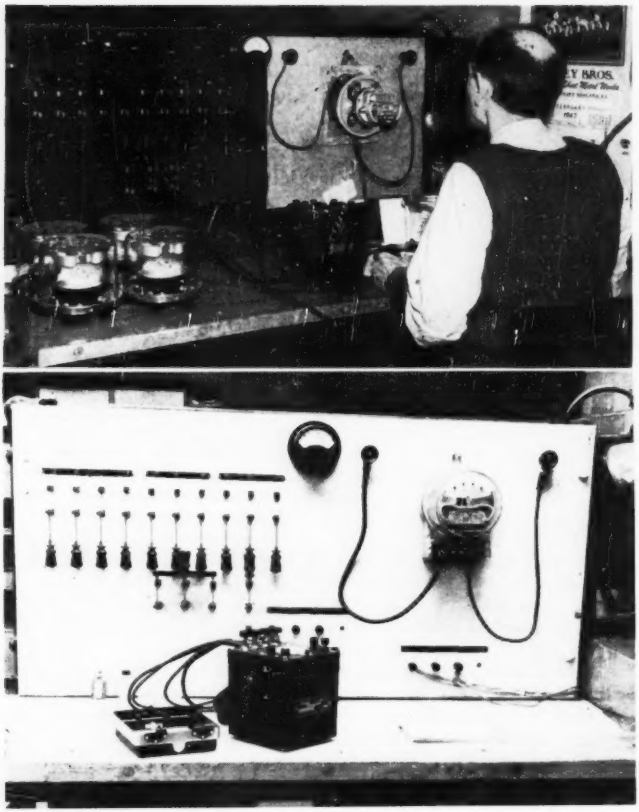
Weight of 2,400-v Transformers — Pounds			
Size kva	Cast Iron	Pre-war	Post-war
3	195	150	130
5	295	225	155
10	460	355	260
15	685	500	307
25	1000	675	493
37½	1400	965	715
50	1660	1175	830
75	2150	1540	1040
100	2220	1780	1325

transformers, but since the large weight reductions have been made, it's been used on three 100-kva transformer installations.

It has been estimated that each installation saves approximately $275 over a two-pole rack type station. It has one other major advantage in that it reduces the right-of-way requirements. In urban construction, the problem of obtaining the space for a two-pole rack just where it is needed is often impossible, and a single-pole transformer installation of this type has been a life saver on several occasions. However, care must be taken to install a heavy enough pole to prevent buckling or bending. For a single heavy transformer a Class 5 pole is needed, and for a heavy three-phase bank a Class 3 pole is required.

Decrease Eye Fatigue In Shop Meter Testing

R. A. MACOMB
District Commercial Manager
Kentucky and West Virginia Power Co
Ashland, Ky.



METER TEST BOARD (top), has paper behind meter to show advantages of light-colored background. Same board (below) and bench are finished in mat pearl gray to reduce eye fatigue and facilitate testing

AN IMPROVEMENT in seeing conditions in meter testing was made possible by reducing the contrast between the old dark background and a light-finished meter on a shop test table.

Previously testing meters in the shop had long been a source of eye fatigue caused by the high contrast between the black slate test board and the aluminum-finished meter. The board and meter are practically the only objects in the meter tester's range of vision. As levels of illumination increased, this unsatisfactory seeing condition became aggravated instead of alleviated by the vast difference in the amount of reflected light from the black slate board and that from the aluminum-finished meter.

To decrease eye fatigue when using a locally constructed table, the contrast was decreased by finishing the table with a mat, pearl gray, nonconducting paint. The success of this change in finish was evidenced by the following two independent and unrelated acts of employees in the meter department: (1) When there was a choice in the use of the old or new tables, the new table was selected; (2) to decrease the contrast of the older board, a piece of brown wrapping paper was placed immediately behind the meter.

Results

Since then, the older board has been repainted (see illustration). The testers who use these two boards voluntarily reported that they have not had headaches during the afternoon since the improvement was made although they frequently had them before. While no accurate check was attempted to ascertain any resulting increase in efficiency, the meter superintendent feels and his testers concur that an improvement in accuracy and number of meters tested has been made. This was accomplished by: (1) Decrease in eye fatigue; (2) improvement in seeing conditions; (3) decrease in nervous muscular tension.

Calcutta Power Plant Built on Land Raft

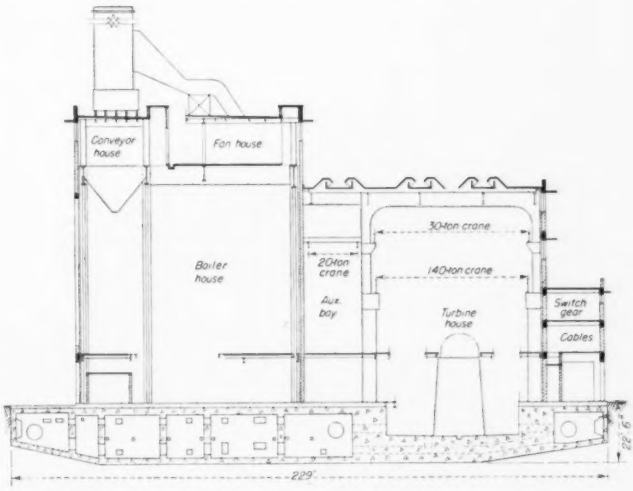
ONE of the largest modern applications of the displacement raft type of foundations is now under construction for the new steam power station of the Calcutta Electric Supply Corp in suburban Cossipore, according to McGraw-Hill World News. When completed the station will have an installed capacity of 210,000 kw in the form of two 30,000-kw and later three 50,000-kw steam-driven turbo-alternators.

Cellular-type Raft

The power station superstructure, together with the administrative building, is carried on a large cellular-type foundation raft, because borings made at site showed the ground to consist of clays and clay-silts of poor bearing quality.

By going to a depth of 21 ft (only 4 ft greater than required for circulating mains and auxiliaries) and using cellular construction, sufficient displacement could be obtained to reduce the gross bearing pressure to 1½ tons per sq ft. Soil tests showed that with the latter value, settlements, although appreciable, would not be objectionable.

The over-all dimensions of the raft are: Width 229 ft, depth 20 ft 9 in.; length is approximately 450 ft.



CELLULAR *raft supports 210,000-kw plant on site of poor soil bearing capacity*

The raft provides a means of obtaining the necessary stiffness and strength in bending and shear to spread concentrations of surface loadings over large areas without appreciable flexing and distortion. Its hollow recesses are used for accomodating the 6-ft diameter circulating water mains, and numerous other mains and cables, for station use.

The boiler house and turbine house are provided with structural steel framework with brick walls and reinforced concrete floors and roof. The administration building, ash plant house, and the transformer annex have reinforced concrete frames with brick panel walls.

Future Depends on Encouraging "Impulses to Progress"

An Editorial in ELECTRICAL WORLD, *October 26, 1929*

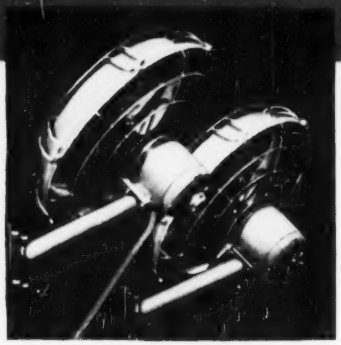
"AT DEARBORN this week President Hoover said: "Our scientists and inventors are among our most priceless national possessions . . . Research is one of the most potent impulses to progress." . . . The world goes forward over the corpses of dead ideas, yet it grants a very reluctant recognition to newly born knowledge. It took twenty years for Europe to learn that Columbus had discovered America. Modern industry must be alerted to discard outgrown methods and should unhesitatingly administer lethal doses to speed their demise. Many first class funerals are indicative of a healthy growth. . . . It may be that energy will be instantly available to any one, anywhere and at any time. Even electrically propelled aircraft may fly back and forth or hover above the earth, and seasonal variations of temperature may be rendered free from discomfort indoors or out. All these things are more than probably. Undoubtedly they are inadequate to express the future. . . . To look forward in 1879 to the world of today was beyond the dreams of men, however full-visioned, and try to foresee the world of tomorrow leaves the imagination gasping and weary. The electric light and power industry pauses at a significant milestone. Its future road must be built on "impulses to progress" such as Mr. Edison."

Correction

We regret that an error slipped by us in checking our illustrations for Mr. Oestreicher's article, "Remote Control Uses Saturable Reactor" (EW, June 4, pg 90). The coordinates for the V-A characteristics for an a-c welder should of course be a-c volts and amperes instead of d-c as shown.

67% extra capacity

with General Electric "Super-Fan" cooled power transformers



This is the aphonic fan used with General Electric's "Super-Fan" cooled transformers. Each of these 19½-inch fans delivers 4000 cu. ft. of air per minute under pressure, and is driven by a three-phase, 230-volt, ½-hp motor.

This is a typical class OA/FA/FA transformer—a transformer with a self-cooled rating and two distinct, higher ratings using two different levels of forced-air cooling. It was introduced by General Electric in 1943, and now has a firmly established place in the forced-cooled family of power transformers.

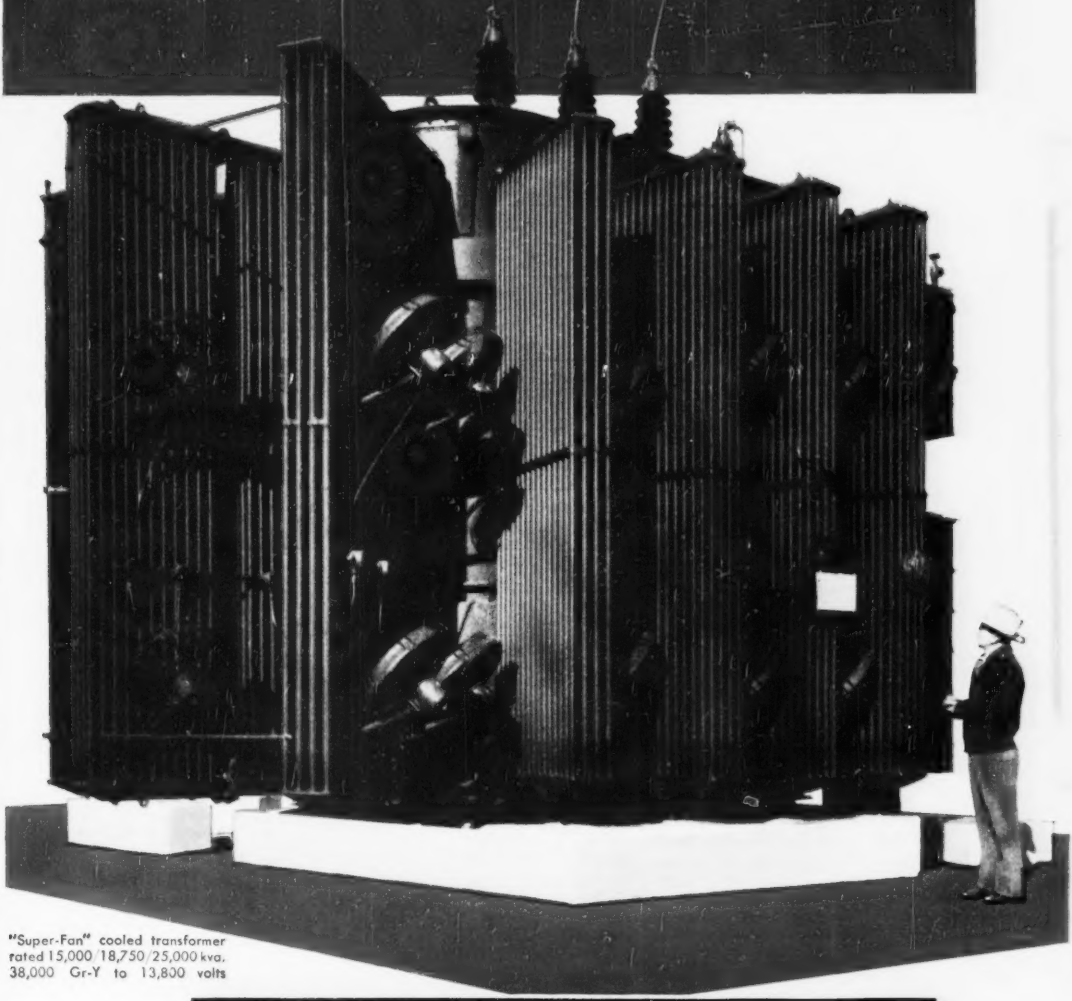
Self-cooled, the transformer is rated 100%. With one set of fans, this rating is increased to 125% and with both sets of fans, the rating becomes 167%. The fans are automatically controlled by means of winding temperature equipment as the load increases or decreases. The "Super-Fan" cooled transformer has less total weight, smaller physical size and a lower price than a comparable self-cooled unit.

"Super-Fan" cooling finds its greatest application on transformers in the range of 10,000 to 83,333 Kva. This transformer has two principal fields in which it finds the greatest acceptance. It is widely used in place of self-cooled transformers where the saving in cost, over-all weights and dimensions are important. "Super-Fan" cooling is also used in smaller sizes as an alternative to forced-oil-cooled transformers where the latter cannot be economically justified, or in any application where an increase in rating is desired without the use of oil pumps.

* * *

"Super-Fan" cooled transformers represent but one example of present-day accomplishments in large transformer design. The whole picture is continually changing. But with all the changes one constant remains—you can continue to look to General Electric for leadership. Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

whenever needed



"Super-Fan" cooled transformer rated 15,000/18,750/25,000 kva, 38,000 Gr-Y to 13,800 volts

GENERAL ELECTRIC

Capacitor Connections And Fusing Schedule

An adaptation from distribution practices of Central Maine Power Co

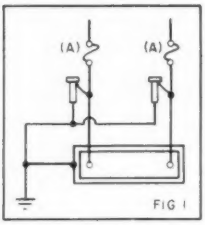


FIG 1—15-kva bank, 1-phase, 2400 v and 7200 v (Note 2)

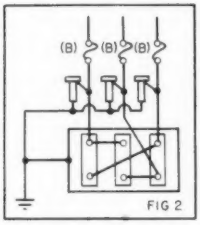


FIG 2—45-kva bank, 3-phase delta, 2400 v and 7200 v

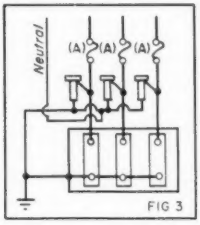


FIG 3—45-kva bank, 3-phase wye 2400/4160 v and 7200/12470 v

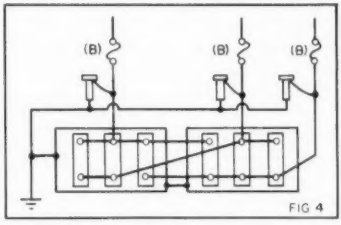


FIG 4—90-kva bank, 3-phase delta, 2400 v and 7200 v

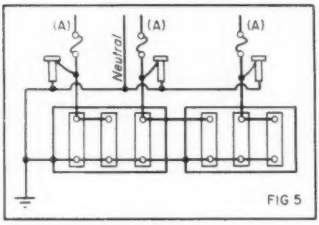


FIG 5—90-kva bank, 3-phase wye, 2400/4160 v and 7200/12470 v

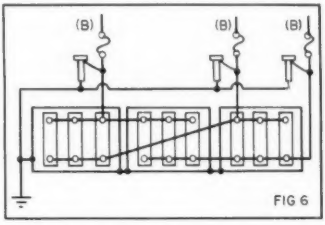


FIG 6—135-kva bank, 3-phase delta, 2400 v and 7200 v

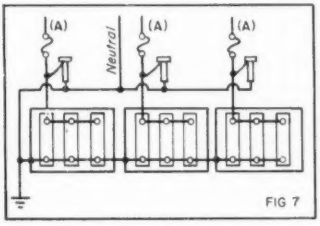


FIG 7—135-kva bank, 3-phase wye, 2400/4160 v and 7200/12470 v

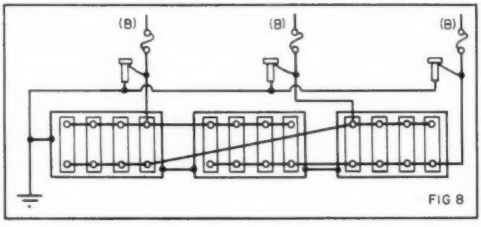


FIG 8—180-kva bank, 3-phase delta, 7200 v (Note 3)

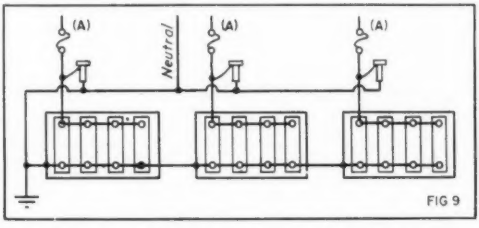


FIG 9—180-kva bank, 3-phase wye, 2400/4160 v and 7200/12470 v

Line Fuse Rating for Capacitor Banks

Nominal Capacitor Volts	2400		7200	
Capacitor Bank, kva	Ampere Size of Fuse (Note 1)			
	(A)	(B)	(A)	(B)
15	15		5	
45	15	25	5	10
90	25	50	10	15
135	40	65	15	25
180	50	*	20	30

* 180 kva at 2400 v to be installed as two 90-kva banks. No fuse larger than 70 amp is to be used except on specific approval from the Distribution Engineering Department.

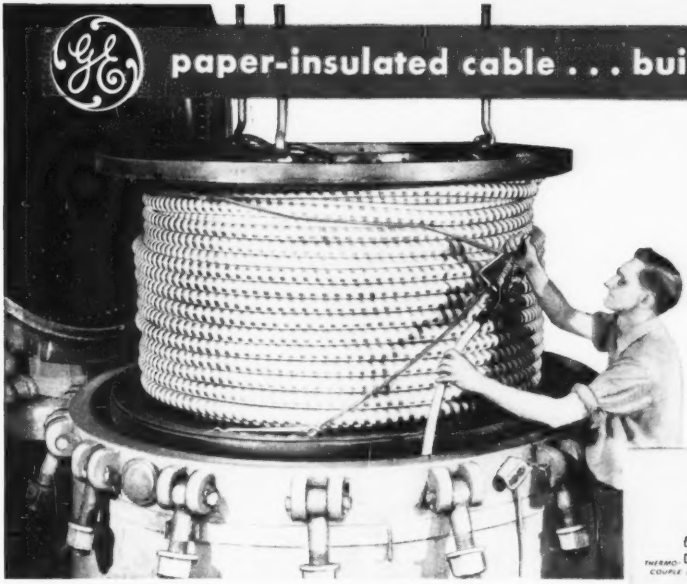
NOTES

1. Letters (A) and (B) are references to line fuse ratings listed in table and to fuse locations indicated in connection diagrams. Wherever possible so-called "fast" fuse links should be used.

2. For single-phase unit, omit cutout and arrester on neutral wire on grounded line.

3. For 180 kva bank, 2400 v delta, install as two 90-kva banks (see Fig 4).

paper-insulated cable . . . built for stability



VACUUM-DRIED . . . *electrically*

—to give uniform quality, long cable life!

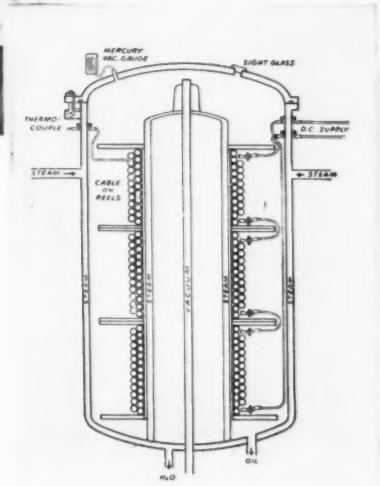
It's only one example, but *electric* vacuum-drying is typical of the extra care that goes into the making of General Electric paper-insulated cable, solid and gas-filled types. By means of this exclusive process, all air and moisture is removed from the assembled cable prior to impregnating, and the cable is heated and dried *uniformly* throughout. This leads to *uniform* quality that assures you of long years of cable service.

Test after test for cable quality!

In many other ways, too, General Electric makes sure of the quality of the cable you get. Over 25 different tests are made on the copper, paper, oil and lead used. Special machines of G-E design, equipped with automatic constant-tension devices, apply paper to the conductors with even-spaced uniformity. Insulation is applied in a special, constant-humidity room, to maintain uniformity of paper tension after moisture is removed.

Complete control for dependability!

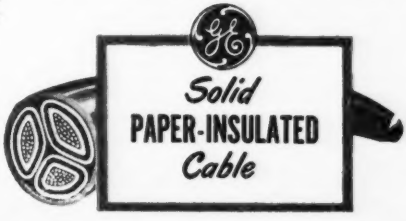
As a further control, each cable is tested 14 different times during manufacture, with over 40 different points checked! With precision methods like these, you can depend on every foot of G-E paper-insulated cable. Check with your local G-E representative on what savings it can mean to you. *Section W36-727, Construction Materials Department, General Electric Company, Bridgeport 2, Conn.*



Here's how it's done!

Before impregnating and leading, reels of General Electric paper-insulated cable are placed in a steam-jacketed drying tank, as shown in photo and diagram above. Conductors are attached to vacuum-tight leads connected to high-current generators. The heat generated is *inside* the cable where it is most effective—assuring uniform heating and drying during the vacuum process. Steam, introduced around the tank and in the center dome, maintains constant temperature throughout the tank. Thus—electrically-uniform heating and drying are obtained throughout the cable's length.

GENERAL ELECTRIC



Foundations for Wood Poles

III—Sinking Load and Overturning Load Charts

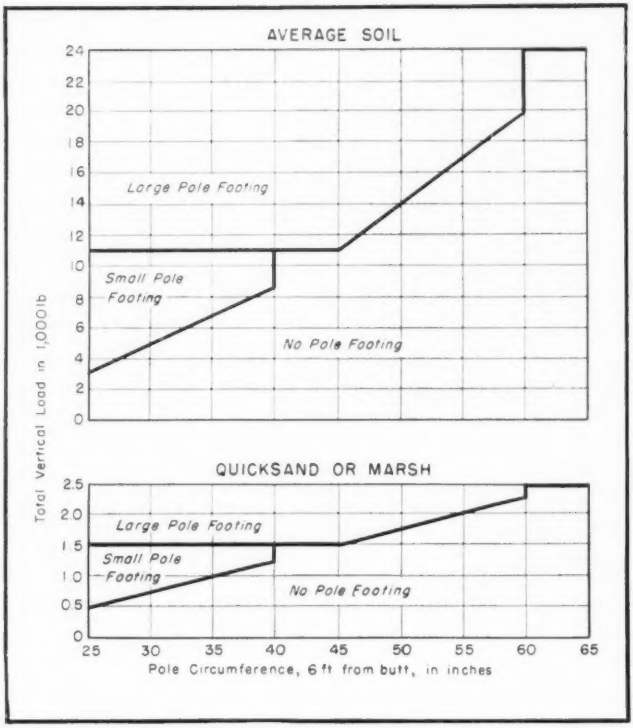


FIG 7—ALLOWABLE VERTICAL LOAD ON POLES is indicated for pole circumference and soil conditions.

Vertical Or Sinking Load Charts

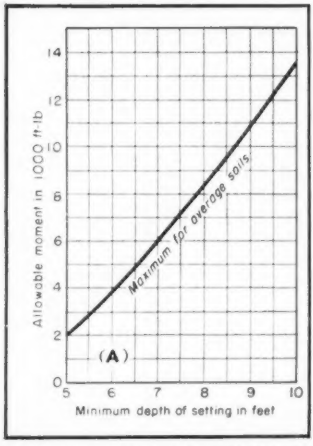
Notes on use of charts: Find the point of intersection of the total vertical load on the pole and the circumference of the pole being used. Area within which this point falls indicate the type of pole footing required, if any.

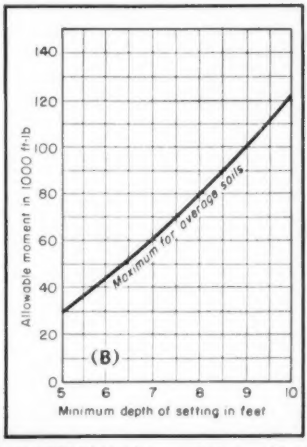
Horizontal Or Overturning Load Charts

1. Pole in place two Spring seasons
   a. Set in earth may be considered as having a stone toe.
   b. Set in concrete pavement may be considered as having a log heel and stone toe.
2. These charts are based on a safety factor of 1 (one) for both transverse and longitudinal loads.

Procedure for use of the charts in pole-footing design will be outlined in an ensuing issue.

An adaptation from overhead lines standards of Detroit Edison Co.; continuation of a four-part serial which began in Electrical World, June 4, 1949. Illustrations have sequence numbering throughout the series of articles.





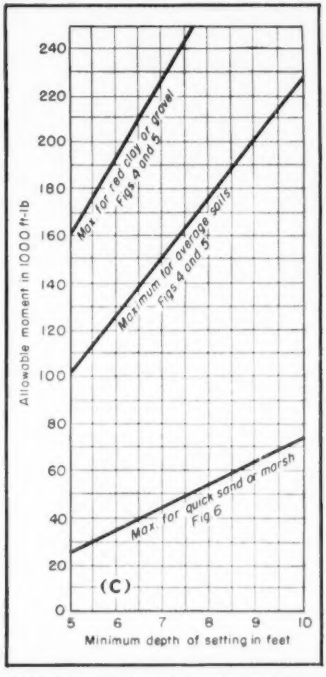

Max. for red clay or gravel Figs 3 and 5
Maximum for average soils Figs 4 and 5
Max. for quick sand or marsh Fig 6
(C)
Allowable moment in 1000 ft-lb
Minimum depth of setting in feet

FIG 8—ALLOWABLE HORIZONTAL LOAD ON POLES is indicated for: (A) New pole foundations not reinforced. (B) Pole foundations reinforced with log heel and stone toe (Fig 2) or with full crushed stone (Fig 4). (C) Pole foundations reinforced with full concrete (Fig 4), with concrete heel and toe (Fig. 5), and with barrel construction (Fig 6).

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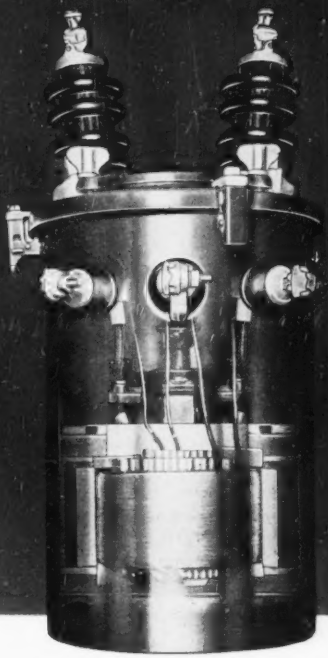


GREATER SHORT-TIME OVERLOAD CAPACITY

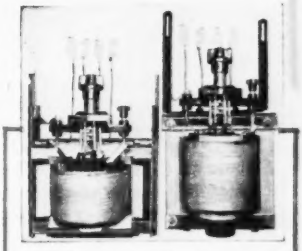
BETTER VOLTAGE REGULATION

Moloney HiperCore Transformers have cores of cold-rolled, high permeability, oriented silicon steel. The improved characteristics of this core material make possible reductions in transformer size and weight, better voltage regulation and increased short-time overload capacity.

Reductions in size and weight range from 15% to 30%. Because they are smaller and lighter, HiperCore Transformers are more easily and quickly installed on the poles . . . are easier to handle and take up less space on the line truck and in the storeroom.

Through lower impedance, better voltage regulation is possible at all loads with HiperCore Transformers. This means greater customer satisfaction . . . because of reduced secondary voltage fluctuations during sudden or intermittent load changes . . . and because of decreased voltage drop during peak load periods.

HiperCore Transformers have improved short-time overload characteristics which provide better peak load performance and longer life. Reduced coil mass, together with extensive use of cooling ducts, results in more rapid cooling of the windings and in a lower hottest-spot temperature gradient.



HiperCore core-and-coil unit and conventional type core-and-coil unit. Both are rated 3 Kva, 12470 Gr. Y/7200-120/240 volts. Smaller size of HiperCore unit achieved by use of wound cores made of high permeability, oriented, silicon steel.

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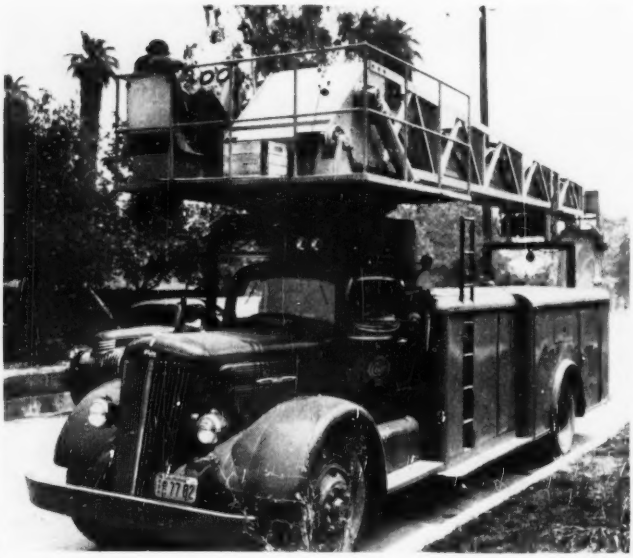
Insulator Washer Can Do 30 Poles per Hour



OPERATING CONTROLS are at base of boom where operator has clear view at all times. Boom can be extended from this carrying position to full 65-ft height at full rotation and return in one minute

HINGED BUCKET at end of rotatable, extendable boom carries man operating high pressure nozzle on this insulator washing truck. Performance of the equipment has stepped up washing to as high as 30 poles per hour

SOUTHERN CALIFORNIA EDISON has designed and is operating a truck capable of washing insulators on 30 poles per hour. An all-aluminum extendable boom rotating 360 deg is the heart of the design.

At the end of the boom is a hinged bucket to carry the man doing the washing with a high pressure nozzle. Position of the boom and extension is controlled by an operator who sits at the base of the boom. The boom may be elevated to 85 deg above horizontal, and with full extension the bucket is 65 ft above ground level. The elevating, rotating and extending mechanisms can be operated singly or in any combination, and can stop and hold the bucket in any position. Multiple cut-out switches provide for emergency stopping of all movement of the bucket from any one of three points—the bucket, the base of the boom, or the cab of the truck.

Excellent mobility of the equipment is indicated by the complete operating cycle—elevating from 0 to 85 deg, full rotation of 180 deg from center position, full extension and return to original carry position in one minute. Power for operation of the hydraulic system powering the boom, and for the high pressure water pump is supplied from a power take-off on the truck.

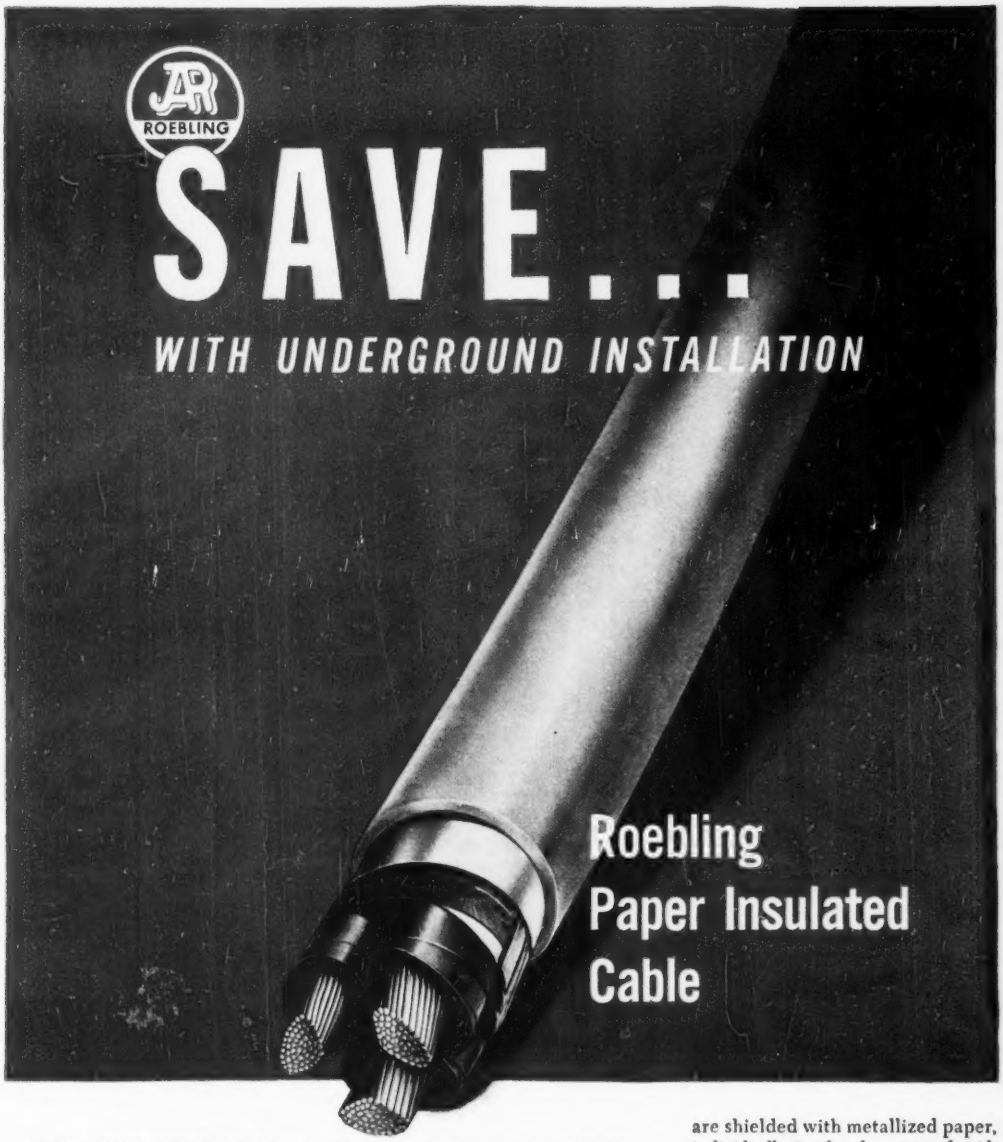
Water is supplied to a specially designed nozzle at 500 to 600 psi. The nozzle incorporates a number of small parallel tubes to reduce swirl in the water before it passes through the interchangeable tips of $\frac{1}{8}$, $\frac{3}{16}$ or $\frac{1}{4}$-in. diam. This provides a compact stream with a diameter of 2 in. at 15 ft distance, and minimizes the tendency to spray.

The washer is mounted on a ten-ton truck, which carries a 700-gal water tank. Water is replenished by a 1,500-gal tank truck during continuous washing operation. A hydraulic cab-operated jack on each side supplies stabilizing support when the boom is extended to the side of the truck.

Demountable Tower Aids Transformer Installation

TO ERECT a 10,000-kva transformer at Louden under winter conditions, the Central Maine Power Co utilized a dismantling tower, crane and trailer. The tower was designed for heavy work as a permanent piece of equipment at Moshers substation. It consists of structural steel members bolted together, and is approximately 35-ft high x 20-ft wide on centers, with base sides about 12-ft wide. The 4 main members or legs illustrated are 15-in., 42.9-lb I-beams. The top members are 18-in., 60-lb I-beams. Horizontal cross members are in general pairs of 6-in., 10.5-lb channels, diagonal bracing being usually pairs of 3 x 2 x $\frac{5}{16}$-in. angles.

After the tower was dismantled at Moshers it was reassembled by the



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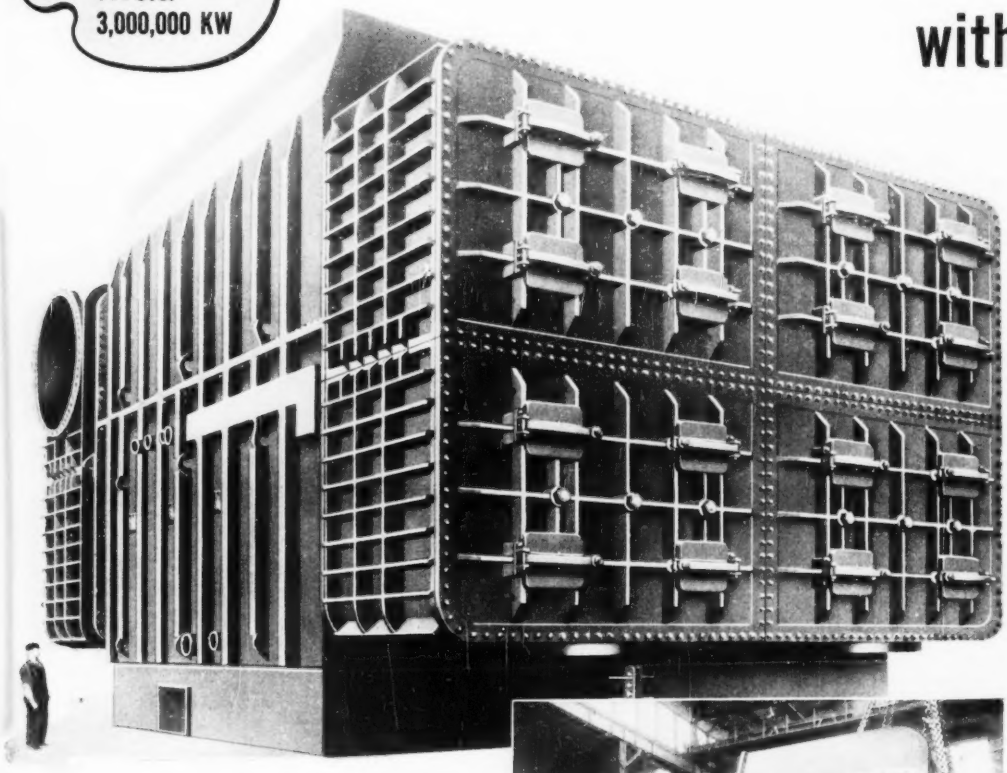
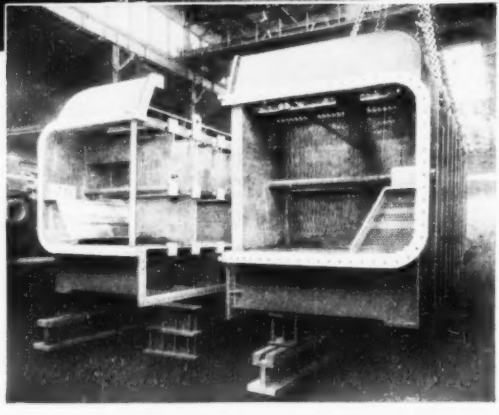


(Above) This giant 90,000 sq ft condenser will serve a 150,000 kw turbo-generator. The compactness of the I-R design made it possible to fit the cube-shaped space available.

(Right) Factory assembly of a 32,500 sq ft condenser. Notice the full flanged joints and bolting pads of the internal bracing, which eliminate field-fitting and welding.



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I-R Rectangular Condensers

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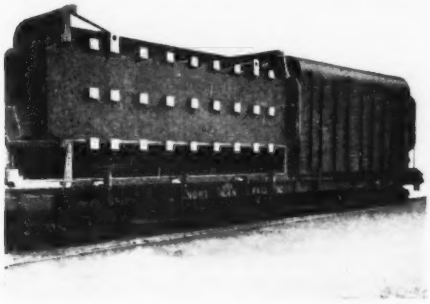
BACKED BY OVER 3,000,000 KW. Post-war installations and orders for Ingersoll-Rand condensers of *rectangular design* to serve over 3,000,000 kw of turbo-generators prove that utilities are taking advantage of the savings in this compact, high efficiency condenser. I-R Rectangular Condensers, built with liberal design proportions, make the most efficient use of the rectangular space available under the turbine foundations.

Twenty-seven years ago Ingersoll-Rand broke with tradition in setting a new standard in heat-transfer efficiency which greatly reduced the amount of surface and physical size of a condenser required for a given capacity. This I-R pioneered design provided positive control of the steam flow through a low-friction-loss tube nest, thereby eliminating "drone" surface and causing all the tubes to work at a maximum condensing rate.



A condenser, now in sections, on its way to the customer's plant. When erected all parts lined-up perfectly and there was a minimum of field welding. No field welding is necessary on I-R condensers being built today.

For years these features were built in the famous "Heart Shape" shell. Today to meet the even more stringent space requirements *Ingersoll-Rand has again led the field* by successfully incorporating these time-proven features in a still more compact rectangular shell.

(2) Complete FACTORY ASSEMBLY and FLANGED CONSTRUCTION to eliminate field-fitting and welding

Every I-R condenser is completely assembled and hydrostatically tested in the factory. On units that are too large to ship in one piece, all mating surfaces of each section are machine-flanged, aligned, and dowelled. All internal bracing which must be split for shipment is also machine-flanged.

Thus when these sections arrive at the customer's plant they are easily bolted together with no field-fitting necessary. No erection welding is required in the field. "Flanged Construction" is an I-R tradition . . . in use since 1922.

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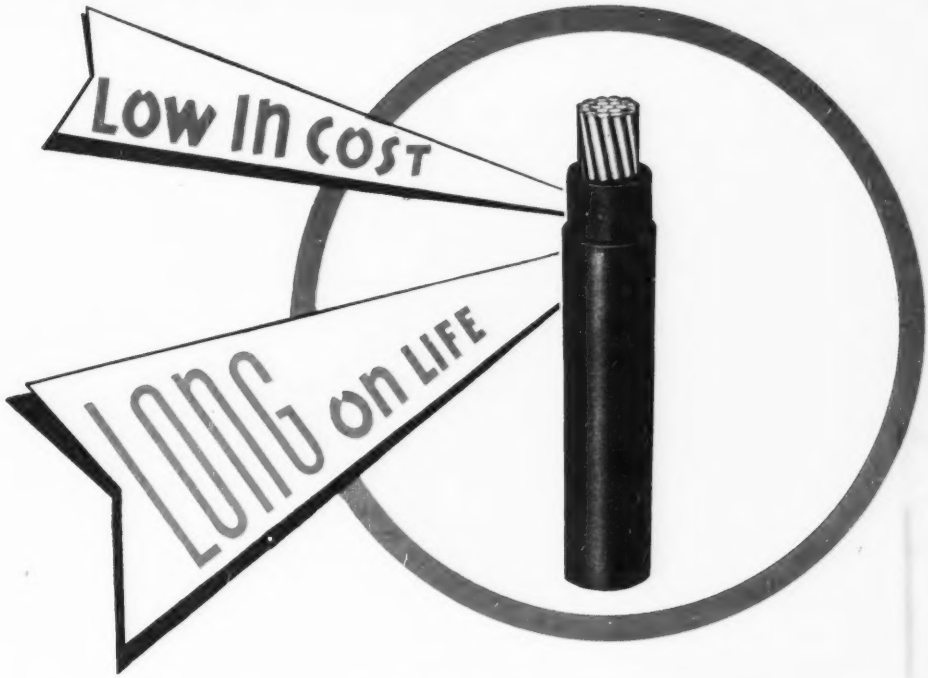
A-FRAME TOWER with bolted sections was reassembled by mobile crane before supporting 50-ton transformer and lowering it to permanent foundation by chain falls

contractors at Louden. This was done largely with the aid of a crane with a 60-ft boom. The base of the tower was set on 12-in. square timbers planked over with 3-in. wooden strips to form a mat which spread out to provide a secure base over the ice and snow. Two days were required for this job in order to insure a proper footing for the A-framing. The transformer weighed about 50 tons including all insulation. It is a 3-phase unit, stepping down from 115 to 37 kv. It was brought to the site on a trailer, covering 5 miles in a little under 3 hr. By using a rolling hitch and two 20-in. blocks with 1¼-in. cable slings, the transformer was lifted off the trailer and then lowered by two men working chain falls by hand to its permanent position on its foundations when the trailer was removed. The tower is normally provided with a lifting beam 8 ft long x 12 in. deep, but this was not needed in the above job.

Interrupting Device Has High Capacity

SHORT-CIRCUIT PROTECTION for lower voltage feeders and distributing systems has been advanced materially through a recent Chase-Shawmut development. This is a current-limiting device known as "Amp-trap" whose performance is



Low in cost, long on life. That's the simple story of ANHYDROPRENE Wires. And those are the reasons why it pays to remember ANHYDROPRENE whenever you're planning new transmission and distribution systems, or are preparing to rewire those already in use.

ANHYDROPRENE Wires consist only of conductor, the famous Anhydrex insulation, and a thin, but tough, neoprene jacket. On some of the large sizes a tape is inserted between insulation and jacket. This simple construction establishes low purchase cost and produces a small-diameter, lightweight wire that's inexpensive to install.

ANHYDROPRENE construction also provides sound electrical and physical properties. There's the low water absorption and high dielectric strength of Anhydrex insulation. There's the resistance to abrasion, acids, corrosive chemicals, heat, light and flame of the neoprene jacket. At 8000 volts and under, ANHYDROPRENE Wires can be operated at copper temperatures as high as 75°C. These features assure trouble-free service year after year, even under unfavorable conditions. And long, trouble-free service means low installation costs and infrequent replacements.

ANHYDROPRENE Wires can be racked on walls and installed underground in ducts. You'll find them especially dependable for plant and shop wiring; for instrument wiring; as underground primaries, transformer leads, and pole line risers; and in signal and control circuits.

Simplex

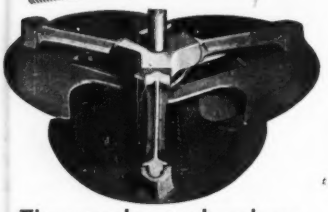
WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

EVERSTICK ANCHORS...

First Choice for

PERMANENCE
HOLDING POWER
LONG LIFE
SAFETY



They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install — made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "The Anchor of Merit"
FAIRFIELD, IOWA

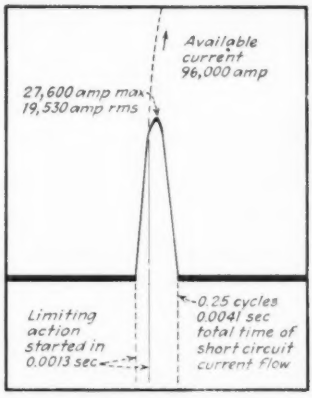

Available current 96,000 amp
27,600 amp max
19,530 amp rms
Limiting action started in 0.0013 sec
0.25 cycles 0.0041 sec total time of short circuit current flow

FIG 1—SHORT CIRCUIT PERFORMANCE on 60 cycle a-c at 600-v of a medium speed 400 amp "Amp-trap". Peak arc voltage was only 156% of normal

based on the use of composite link elements, of which silver is one. The links are embedded in quartz sand. The high melting point of silver compared with zinc or lead is advantageous. Silver vapor is practically a non-conductor and thus is an excellent arc deterrent. In the presence of an arc, quartz sand gives off no gas; it has about double the heat absorption ability of switch oil, and greatly aids high speed interruption of a circuit.

The chief function of the device is to limit short-circuit currents. It is designed to handle shorts where the available current concentration may reach 200,000 amp. It does not interrupt 200,000 amp, but is said to instantaneously and effectively stop or limit the build-up of short-circuit current. Here lies the distinction between this device and a fuse. A fuse does not operate fast enough to restrict short-circuit current to a low value.

During fault interruption circuit voltage tends to force short-circuit current across the arc gap, regardless of the type of interrupting device. In this new device the arc gap is very short and the arc path small in cross section and of high resistance. Potential drop across the arc is instantaneously established at a value equal to or greater than the circuit voltage, and the current flow is said to be cut off in micro-seconds.

This advantage over the fuse is illustrated by a test of a 400-amp fuse and 400-amp "Amp-trap". The available short-circuit current on d-c was 75,000 amp at 600-v. The standard fuse reached a current peak of 31,000 amp and exploded. The 400-amp "Amp-Trap", under identical conditions, cut the current off at 10,120 amp, clearing the circuit in 0.0035 sec. The fuse was called upon to absorb nearly nine times the energy which the "Amp-trap" encountered on the same duty. The fuse was inadequate thermally and mechanically to absorb the greater energy. The "Amp-trap's" design factors can be changed as required to limit peak or cut-off current and times to higher or lower values over a considerable range. This permits accurate cascading or selectivity for a series of ampere ratings.

The new current limiting device has an over-all length less than similarly rated standard fuses. Because of their relatively small size, mounting clips are closer together. This prevents insertion of standard fuses in place of the new device. It is built in all ampere sizes from ¼ amp to 4,000 amp, for a-c circuits up to 600-v and for d-c circuits up to 750-v.

Applications include use in combination with all types of safety-enclosed switched, eg where large capacity entrance cables enter from highly concentrated a-c or d-c networks. Another is where the device is built in special fuse clips to serve

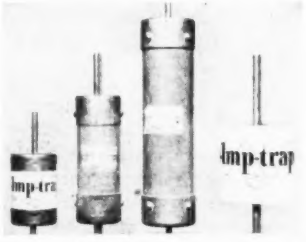


FIG 2—COMPARISON of sizes of new current limiting device and standard fuses

as a disconnecting unit. This saves space, notably in supplying additional protection for main buses and busducts. Design provides that should a fault to ground occur on any conductor, the "Amp-trap" will cut it off before it grows to involve other conductors in a multi-conductor short. In a typical case a 200-amp "Amp-trap" on a 440-v, 60-cycle circuit under a 600% overload removed the fault in about 6 cycles.

HI-TENSION NEWS *Junior*

"When something works--- *USE IT!*

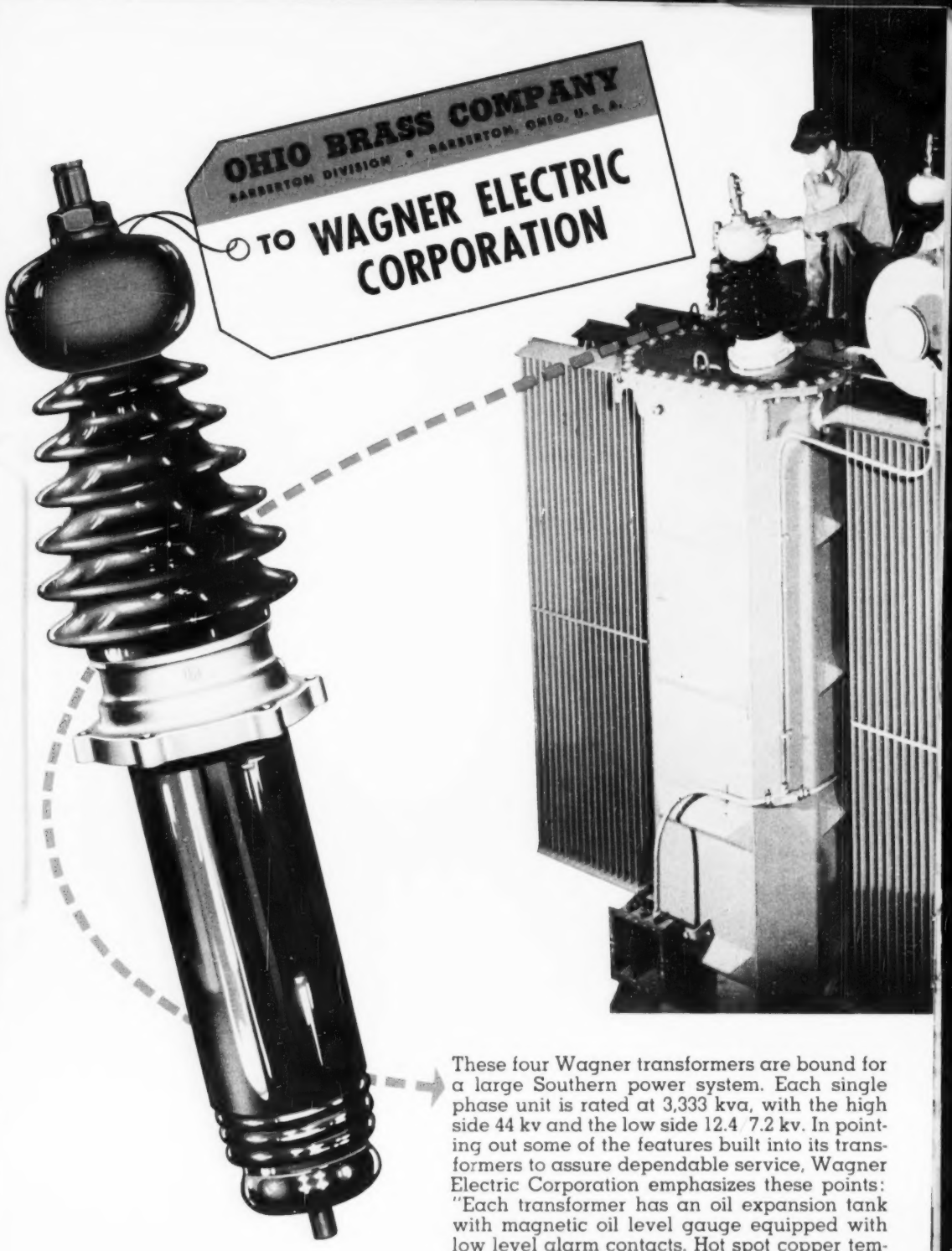
No one can apply a set of tests to a *new* switch and bus insulator and determine its ultimate life–durability isn't that simple to prove. Let's get down to hard facts and look at the *only* reliable proof we know.

Here are three substations; one in the East, one in the South, one in the Mid-west. They all serve major loads today. Two are 33 years old. One is in its 30th year. All are insulated throughout with O-B switch and bus insulators that have been there since the start of service. All belong to power companies which are regular users of O-B insulation in many newer stations; these purchases having been made on the basis of first-hand experience, over long periods of service.

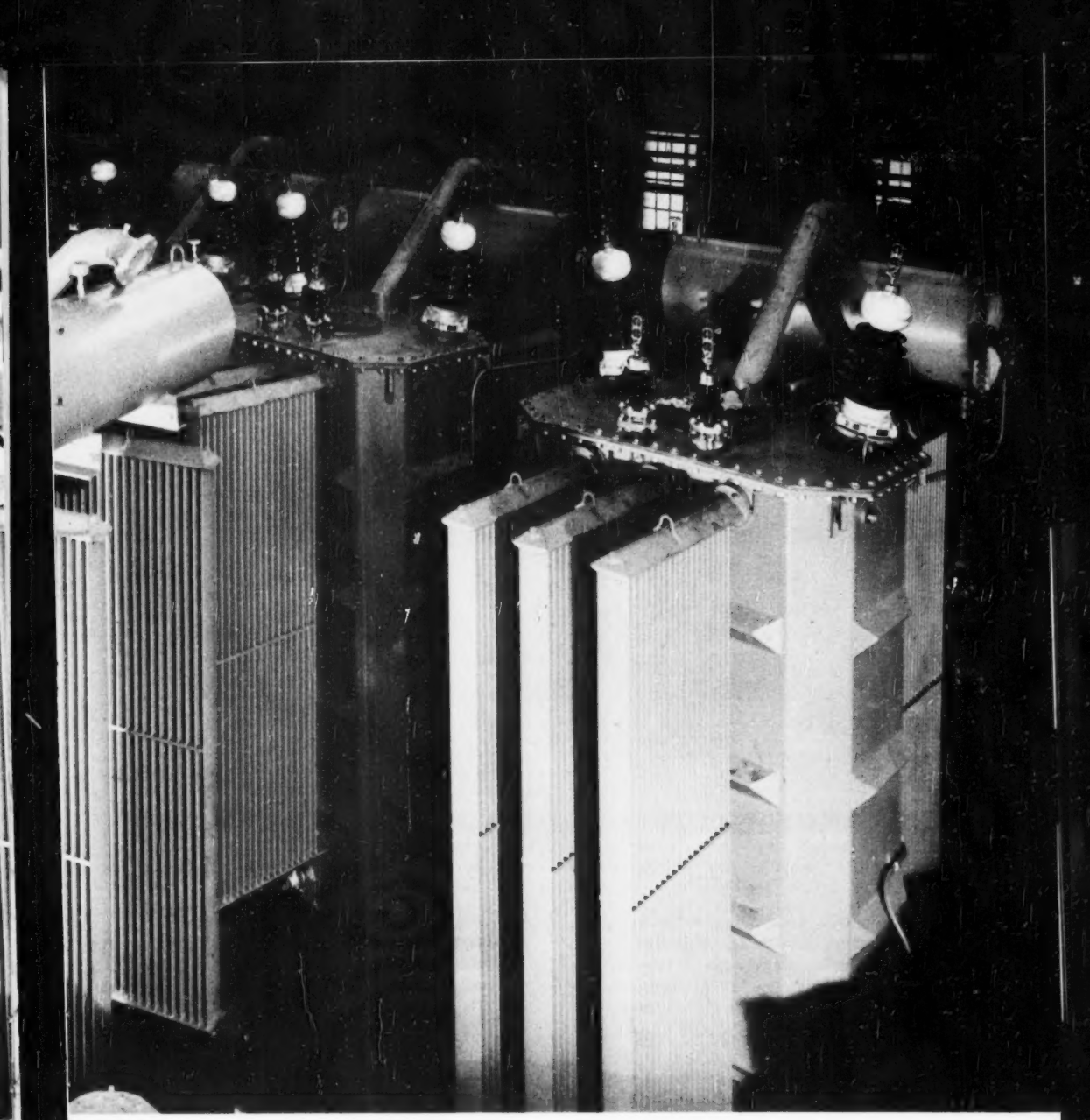
Boiled down to its essence, the moral of this story is, "When something works, use it!" O-B insulation has worked here, and countless other stations--worked well and long. It will do the same for you.

Ohio Brass

MANSFIELD, OHIO, U. S. A.



These four Wagner transformers are bound for a large Southern power system. Each single phase unit is rated at 3,333 kva, with the high side 44 kv and the low side 12.4 / 7.2 kv. In pointing out some of the features built into its transformers to assure dependable service, Wagner Electric Corporation emphasizes these points: "Each transformer has an oil expansion tank with magnetic oil level gauge equipped with low level alarm contacts. Hot spot copper tem-



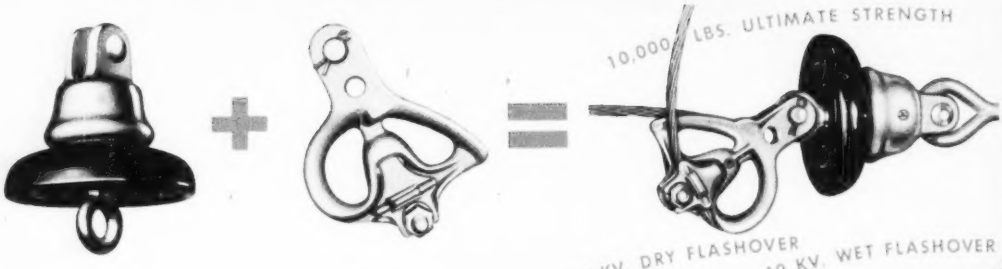
perature and hot oil temperature are indicated with dial thermometers; also with alarm contacts. The circuits for the low oil level alarm and high temperature alarms are terminated in a split type junction box on each transformer. Provision is made for future addition of fans to provide increased capacity." In addition to these specific features is Wagner's traditional manufacturing care, plus . .

BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER

HI-TENSION NEWS *Junior*

How to MAKE DEAD-ENDS THE SAFEST POINT *in urban distribution*



Here is the safe, modern deadend make-up for urban distribution circuits--a practice that is rapidly being adopted on systems throughout the country. This will make your deadends the strongest, safest parts of the line, and will sharply decrease operating hazards, maintenance costs, and service delays.

All the fundamental soundness of O-B suspension insulators is present in the six-inch distribution unit. This same reliability is carried out in the Universal Strain Clamp, designed by transmission experts to preserve the cable as well as give safe support.

Adequate supplies of these O-B components are now available from stock through over 100 local Graybar warehouses. They can be had without delay and, because of Graybar's service, without the added cost of maintaining a private inventory.

Build the modern way with O-B distribution deadends--Buy the modern way through Graybar.

Distributed by GRAYBAR ELECTRIC COMPANY

Ohio Brass

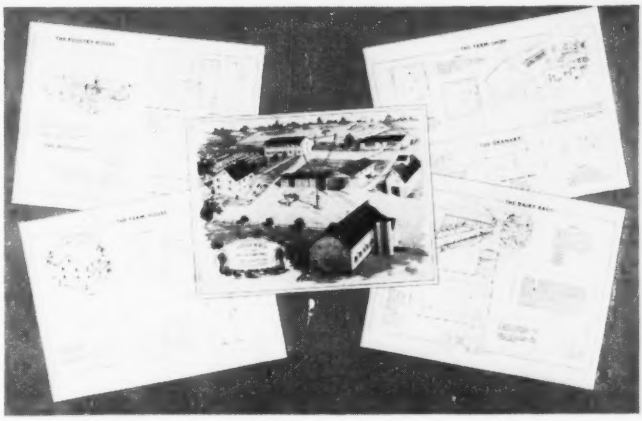
MANSFIELD, OHIO, U. S. A.

2979-M

LOAD BUILDING

To Help Sell Adequate Farm Wiring

RUSSELL GINGLES
Manager
NEMA Farm Electrification Bureau
New York, N. Y.



BASIC DISPLAY is a 7-color piece, perspective of a farmstead, showing load-center-distribution to buildings. Wiring and equipment details of buildings are on supplementary sheets. The five comprise a complete statement of farm wiring adequacy useful towards understanding of its necessity

ANOTHER of those things which long has needed doing, finally has been wrapped up and is ready for delivery. This is the first industry-wide project undertaken by the Farm Wiring Coordinating Committee to focus attention on the need and value of having farms and farm homes adequately wired. The committee, composed of representatives of the NEMA Farm and Rural Market Committee, and the National Adequate Wiring Bureau, has worked for more than a year in the development and production of its initial sales promotional "package."

Consisting of five display pieces, the package was planned to provide power suppliers, wiring contractors and others interested in sound farm wiring, with display pieces for lobbies, windows, meetings and fairs; to illustrate discussions about farm wiring at meetings of farm organizations, rural youth groups and school classes; and for use at meetings of rural service personnel, etc.

Each piece is 30 x 40 in. in size on 80-lb stock. All in color, they are designed to illustrate clearly and effectively electrical equipment for farm and home use, and recommended interior and exterior wiring.

The displays were designed to show only general recommendations and suggestions for wiring and equipment. They are specific, however, as to outlets and circuit information. This plan was adopted to keep clear of wiring practices that might be controversial in different parts of the country. On the present basis, discussion leaders are able to submit the displays as background farm electrification material and inject into their presentations local procedures that conform to adequate wiring standards.

The material was developed under the guidance of J. S. Webb, agricultural engineer of the Philadelphia Electric Co. Philadelphia, Pa. As chairman of the Farm Wiring Coordinating Committee, he faced two difficult jobs: (1) To gather together a small technical group of experts on wiring, agricultural engineering and farm building architecture, and (2) to select an artist with some farming know-how who had the patience of Job.

The wiring job became the responsibility of technical consultants in the National Adequate Wiring Bureau. W. C. Kruger, agricultural engineering specialist, New Jersey State College of Agriculture, and a leader in the Better Farm Buildings Association, was the advisor on electrically operated food production equipment and structures. Home electrification specialists in the power supplier field, planned the electrical equipment for the farm residence. In addition, consultations were held with other experts in college extension departments and farm electrification heads of the electrical manufacturing industry. In the search for a qualified display artist, Mr. Webb turned to his own company and obtained the services of Vincent Nast.

All technical advice and the services of Mr. Nast were contributed to the project, without charge. First printing costs and promotional expenses were absorbed by the NEMA Farm Electrification Bureau. The result is that hundreds of the wiring display sets are being sold today, through the Bureau, at actual reproduction cost, in order that as many as possible can be placed in service in a concentrated effort to drive home to farmers the need and value of adequate farmstead wiring. For until operators of the nation's "food factories" realize the necessity of having planned, engineered wiring installations on their farmsteads, electrical equipment cannot deliver its full quota of time and labor-saving value on the production front or in the home.

CLEAN GLASSWARE is carried on maintenance truck to replace that removed from fixtures. When all clean pieces are gone, the dirty ones are washed and the truck moves on

Office Building Lighting Maintenance Facilitated by Cleaning Truck

E. M. WENNER
Duquesne Light Co
Pittsburgh, Pa.

BECAUSE of the number of fixtures in the 37-story Grant Building, Pittsburgh, Pa. it was necessary to establish a definite maintenance schedule in order that all of the fixtures would be cleaned regularly, thereby assuring efficient and economical operation.

To facilitate fixture maintenance, operating personnel of the Grant Building constructed a unique rubber-tired truck which is capable of handling 16 pieces of fluorescent fixture glassware, extra lamps, washing tanks and other equipment.

Two workmen spend their entire time in cleaning and maintaining the fixtures. Every fixture is completely cleaned on an average of three times a year.

One workman on a ladder removes the glassware and lamp from the lighting fixture and hands them to a second workman on the floor. The second workman takes a clean lamp and glassware and hands them to the man on the ladder who places them in the fixture. When the supply of clean glassware on the truck has been used, the dirty units are washed at one time to replenish the truck supply. Specially designed and constructed tanks speed washing of the fixtures. Only one man is required to replace fluorescent tubes.

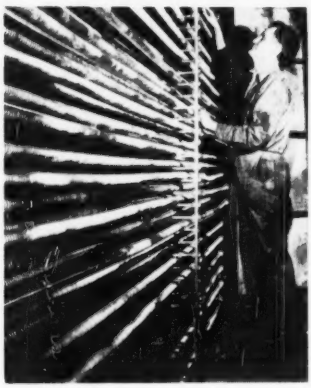
An Ally for Planned Lighting

"THE RIGHT LIGHT" is the title of a 2-page article in the current issue (No 2, Vol 3) of "Trends," publication of the Wood Office Furniture Institute, 730 11th St. N.W., Washington 1, D. C. The article, headed "Your Electric Light and Power Company Makes a Powerful Ally in Selling Modernization," urges office furniture salesmen to make full use of the help available from power company lighting men when office modernization plans are being developed for customers. To quote:

"You know full well that Mr X's present office lighting is far from good. . . . What are you going to do about it? Plenty, if you know the engineering salesman in your territory. . . . So you call him up, make an appointment and meet him at the prospect's office. You introduce him to Mr X and indicate that as part of your service, you are requesting the co-operation of the electric light and power company in making a preliminary survey of his office lighting."

The article continues with suggestions on how the two salesmen can work together in "practical and ethical co-operation with mutual benefit."

Super-Size Air Heater



WIND TUNNEL air tempered by 324 finned heaters, each rated 10 kw

R. E. WRIGHT
General Electric Co
Cleveland, Ohio

TO ACHIEVE the ultimate in control of air temperature and humidity in a wind tunnel in the laboratory of the National Advisory Committee for Aeronautics, recourse was had to an unusual installation of electric air heating. It consists of 324 10-kw fin type heaters mounted in a steel frame across the air stream. The bank consists of 13 vertical rows of 24 heaters and one row of 12 heaters each 10 ft long.

Heater Controls

The heaters are placed on 3-in. centers with rows staggered vertically to present 1½-in. centers to the approaching air stream.

High limit controls on heater sheaths protect against overheating. Further protection is afforded by electrical interlocking between the heater controls and air-flow control valves.

Longer Life

WITH JOSLYN URC POLE LINE HARDWARE

Extend the life span of your pole lines by using Pole Line Hardware made of low alloy high strength steel. This steel will resist atmospheric corrosion four to six times longer than carbon steel and, with the additional protection of Joslyn galvanizing, the expected life of pole line hardware is at least doubled—and this at a negligible increase in cost. Actual figures show that the increase in overall cost of a typical distribution line using URC hardware is less than 2%—a cheap price to pay for double the life. In addition to this, URC hardware is stronger, with a minimum yield strength 50% greater than that of regular steel.

If you are in an area where this happens to your hardware before the ultimate life of the rest of the line has been reached—better consider Joslyn URC Hardware.

Write for new catalog of Long Life Pole Line Hardware.

Branch offices in principal cities

•

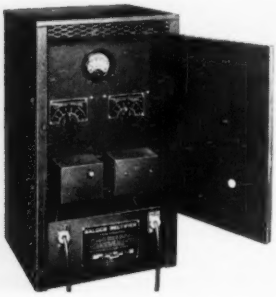
THE JOSLYN CO.
THE SOUTH EAST JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN PACIFIC CO.

JOSLYN MFG. AND SUPPLY CO.

Complete Pole Line Equipment

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

NEW EQUIPMENT



Industrial Charger

AN AUTOMATIC BATTERY CHARGER for use with lead acid batteries of three or six cells has been developed by Baldor Electric Co, 4357 Duncan Ave, St. Louis 10, Mo. It uses a selenium rectifier designed for continuous duty and is fan cooled.

After correct dial setting is made, operator need only press starter button. After charging at fast rate of 60 amp, voltage relay shuts device down to safe soaking rate. Charger is then controlled by electric time clock. The manufacturer advises that this charger is satisfactory for batteries of 550 amp-hr or less. For further information request Bulletin No. 342.

•

Motor Speed Control

OPERATION of shunt motors up to $\frac{1}{3}$ hp from an a-c line is possible with a single-unit speed control, Type 1,700-A Variac, made by General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass. Constant field voltage is produced by dry-disk rectifier, while variable armature voltage is obtained from an electronic rectifier fed by an autotransformer.

Reported advantages are: Constant regulations in rpm at all speeds; dynamic braking in stop position; lower motor losses due to low a-c ripple in armature; overload capacity several times full-load armature current; and circuit breaker protection.

All equipment, including start-stop-reverse switch, is mounted in 9x12x4½-in. housing. Both 115 and 230-v models are available.

Hinged Clamp Sticks

HARDWOOD CLAMP STICKS that fold in the middle for ease in transporting are made by A. B. Chance Co, Centralia, Mo. They are readily extended and latch rigidly in the open position. A spring button release operates the hinge.

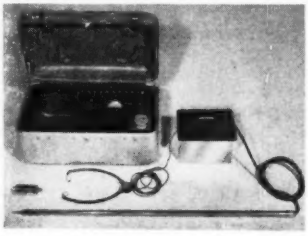
Sliding hand grip opens, closes and retracts jaws which are locked in any position by screw and safety latch. Tap or grounding clamps fit into barrel and lock to hold stick and clamp as a single unit.

Poles and operating rod are of best grade hardwood. Poles are tested at 75 kv per ft for 5 min. Additional insulation and protection from scarring are provided by 12-in. fiber sleeves.

•

Cable Fault Detector

APPLICABLE FOR PIN-POINT LOCATION of open or shorted circuits in all types of unshielded multi-conductor cables, a cable fault detector is announced by



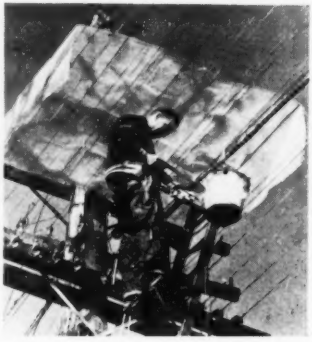
Century Geophysical Corp, 1333 N. Utica, Tulsa, Okla.

Unit is self-contained and includes double carrier, vacuum-tube oscillators, meter continuity test, detachable locating receiver and batteries. External connectors are provided for cables not having plugs. The instrument measures 8 x 9 x 16 in. and weighs 18 lb. Catalog No. 102 contains further information.

•

Overhead Protector

HAVING INSULATING QUALITIES that permit it to be thrown over bare telephone wires without causing disturbances, a transparent overhead covering is fabricated of heavy gage Vinylite



plastic by Plastic Sheeting Co, 1205 E. Grand Ave, Portland, Ore.

Called Star-Tarp, this covering offers protection from wind, rain, snow or sleet. It can be folded wet without fear of rotting. Star-Tarps are made in several sizes.

•

Radioactivity Detector

TO MEET the requirements of field surveys and prospecting in frigid or tropical regions, a portable radioactivity detector, Model PRD1, has a compact electronic scaling circuit and large Geiger-Mueller counter tube in the same waterproof probe. Flexible 5-ft cable connects probe to metal battery box. It is manufactured by Nuclear Development Laboratory, Box 7601, Kansas City, Mo.

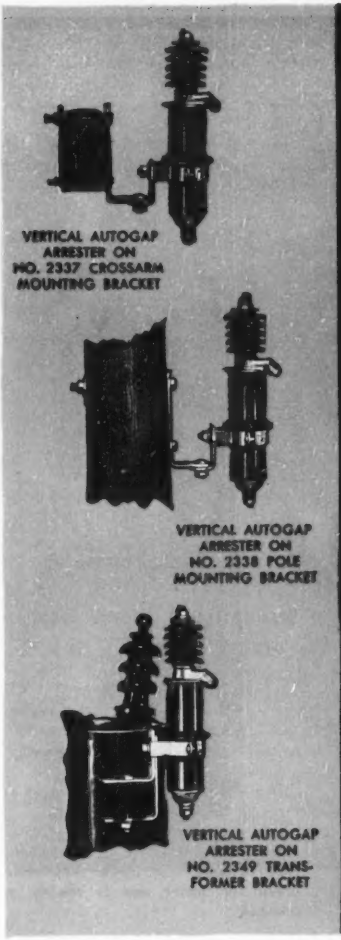
Maximum radiation intensity accurately covered by this device is limited by the scaling ratio (25 to 1) to about 5,000 counts per min. The company advises that under normal conditions no servicing of any kind is necessary for several years.

•

Recessed Troffers

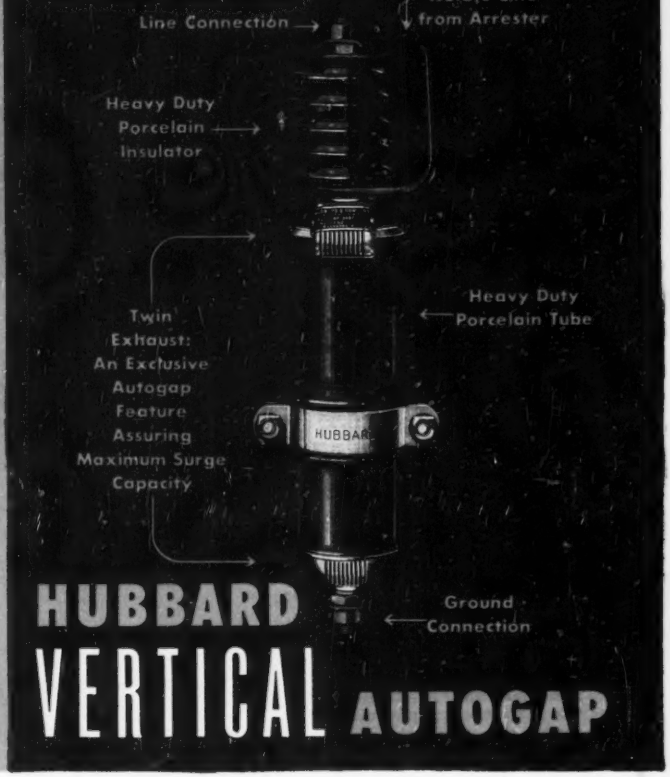
FLANGE TYPE recessed troffer fixtures for use with acoustical and plaster ceilings, and snap-in types for use with T-bar ceiling construction are manufactured by Day-Brite Lighting, Inc, St. Louis 7, Mo. Each type has parabolic reflector and takes two 40-w fluorescent lamps.

Louver assembly is supported by spring tension clips and the manufac-


VERTICAL AUTOGAP ARRESTER ON NO. 2337 CROSSARM MOUNTING BRACKET
VERTICAL AUTOGAP ARRESTER ON NO. 2338 POLE MOUNTING BRACKET
VERTICAL AUTOGAP ARRESTER ON NO. 2349 TRANSFORMER BRACKET

NEW!

-BUT NOT UNTRIED


Air Gap to Isolate Line from Arrester
Line Connection
Heavy Duty Porcelain Insulator
Heavy Duty Porcelain Tube
Twin Exhaust: An Exclusive Autogap Feature Assuring Maximum Surge Capacity
HUBBARD
Ground Connection

HUBBARD VERTICAL AUTOGAP

When the Hubbard Autogap was originally developed and placed on the market, it was designed for horizontal mounting due to mechanical requirements which seemed best solved by a horizontal installation. At the time, however, it was foreseen that a vertically mounted Autogap would be needed, and work was started on its development.

All the operating advantages of the original Autogap are retained in this new vertical design. Construction is exactly the same in principle and all parts in the one design have a counterpart in the other. The only difference, other than the physical arrangement of parts, is that the process of expulsion acts vertically instead of horizontally.

Many hundreds of thousands of Autogaps have proven their efficiency over a ten year period with no failures resulting from operating conditions, excluding those few which have been put out of service by falling equipment.

Stock No.	Voltage Rating	Phase Voltages		60 Cycle Flashover	Min. Impluse Breakdown Voltage (1½—40)	Approx. Shpg. Wt. Lbs. Ea. Inc. Brkt.
		Grounded	Ungrounded			
2330	3 KV	1 to 5 KV	1 to 3 KV	19 KV	30 KV	11½
2331	6 KV	5 to 9 KV	3 to 6 KV	25 KV	40 KV	13¾
2332	9 KV	9 to 13.8 KV	6 to 9 KV	32 KV	60 KV	13¾

One Bracket furnished with each Autogap. Specify Type.

"hang the LOAD on HUBBARD HARDWARE"

HUBBARD AND COMPANY

PITTSBURGH CHICAGO OAKLAND CALIF.

they said **YOU CAN'T!**

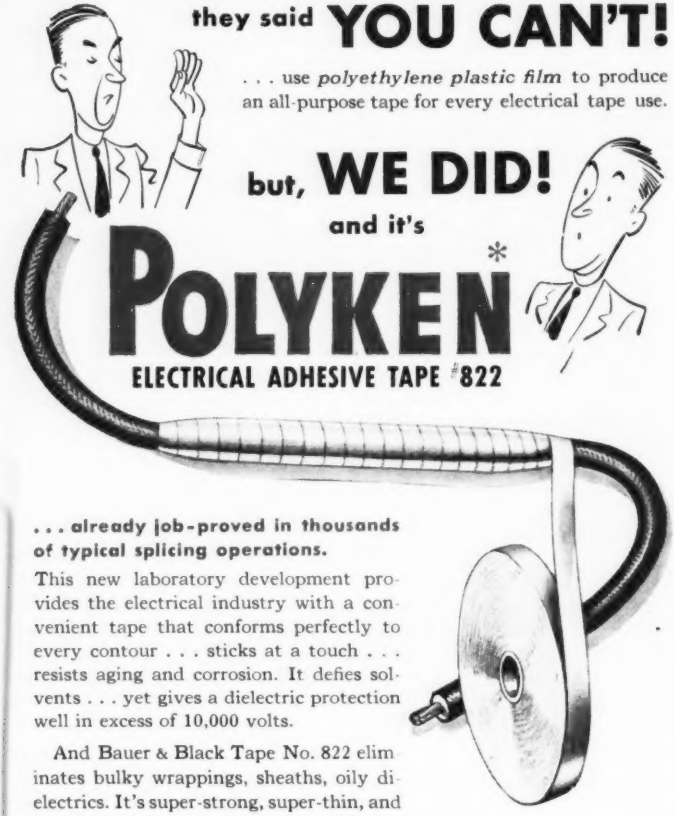
. . . use *polyethylene plastic film* to produce an all-purpose tape for every electrical tape use.

but, **WE DID!**

and it's

POLYKEN*

ELECTRICAL ADHESIVE TAPE #822



. . . already job-proved in thousands of typical splicing operations.

This new laboratory development provides the electrical industry with a convenient tape that conforms perfectly to every contour . . . sticks at a touch . . . resists aging and corrosion. It defies solvents . . . yet gives a dielectric protection well in excess of 10,000 volts.

And Bauer & Black Tape No. 822 eliminates bulky wrappings, sheaths, oily dielectrics. It's super-strong, super-thin, and a perfect moisture barrier. If you haven't already, you'll want to try this important new tape . . . useful in hundreds of electrical applications. Write today for jobber in your area. POLYKEN, Dept. 5-7, 2500 S. Dearborn St., Chicago 16, Illinois.

CHECK THESE OUTSTANDING CHARACTERISTICS AGAINST *YOUR* ELECTRICAL REQUIREMENTS

- **Dielectric Strength:** Over 10,000 volts (9 mils thick)
- **Insulation Resistance:** Greater than 8 x 10^6 megohms conditioned 24 hrs. @ 27° C — 70% R.H.
- **Dielectric Constant:** 2.6
- **Power Factor:** .0050 (10^6 cycles)
- **Corrosion Resistance:** No measurable corrosion effect
- **Solvent Resistance:** No known solvent for No. 822's backing at room temperature
- **Water Vapor Transmission Rate:** 0.24 gms per 100 sq. in. in 24 hours continuous immersion
- **Corona Quenching Characteristics:** Exceptional

A product of

*Reg. U. S. Pat. Off.

BAUER & BLACK

Division of The Kendall Company, 2500 S. Dearborn St., Chicago 16

Industrial Adhesive Tape

PRESSURE SENSITIVE

Production Short Cuts to Reduce Costs • Research to Speed and Improve Methods

turer states that it is easily removed and replaced without tools. Entire fixture is finished in hot-bonded white enamel applied over rust-inhibiting undercoat. Both types are furnished individually wired (circuit wires not included) with sockets, No-Blink type starters, high power factor ballasts for 118-v, 60-c operation.

•

Streamlined Meter Box

Streamlined outdoor meter enclosures of die-cast aluminum have been introduced by Binkley Mfg Co, Warrenton, Mo. The new enclosures are said to provide extra strength and protection against corrosion or streaking of buildings.

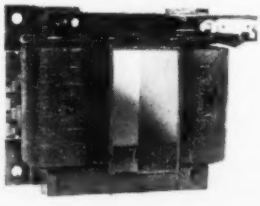
Inside dimensions of the unit shown, for 1-ph meters, are 6x7½x14-in. It is equipped with double strength window glass and an extra heavy ground clamp. Disconnecting test block is mounted below the meter and is readily accessible.

•

Current Transformers

Wound and through-types of current transformers are manufactured by I-T-E Circuit Breaker Co. 1890 Hamilton St. Philadelphia 30, Pa. Illustrated is through-type T-7.

Wound-type units are available in 50 ratings in the 5,000-v class for 5 to 800 amp. Mechanical and thermal strengths are said to be from 125 to 1,500 times



"The men like to work with penta-chlorophenol treated poles! —THEY'RE CLEAN!"

Workmen, who maintain communication and power lines, enjoy working with poles that have been given the PENTA-chlorophenol treatment. This modern wood preservative leaves poles clean and easy to handle.

Light and power companies everywhere have found that PENTA-chlorophenol-treated poles *last longer*, for they have been given thorough, lasting protection against decay and termites.

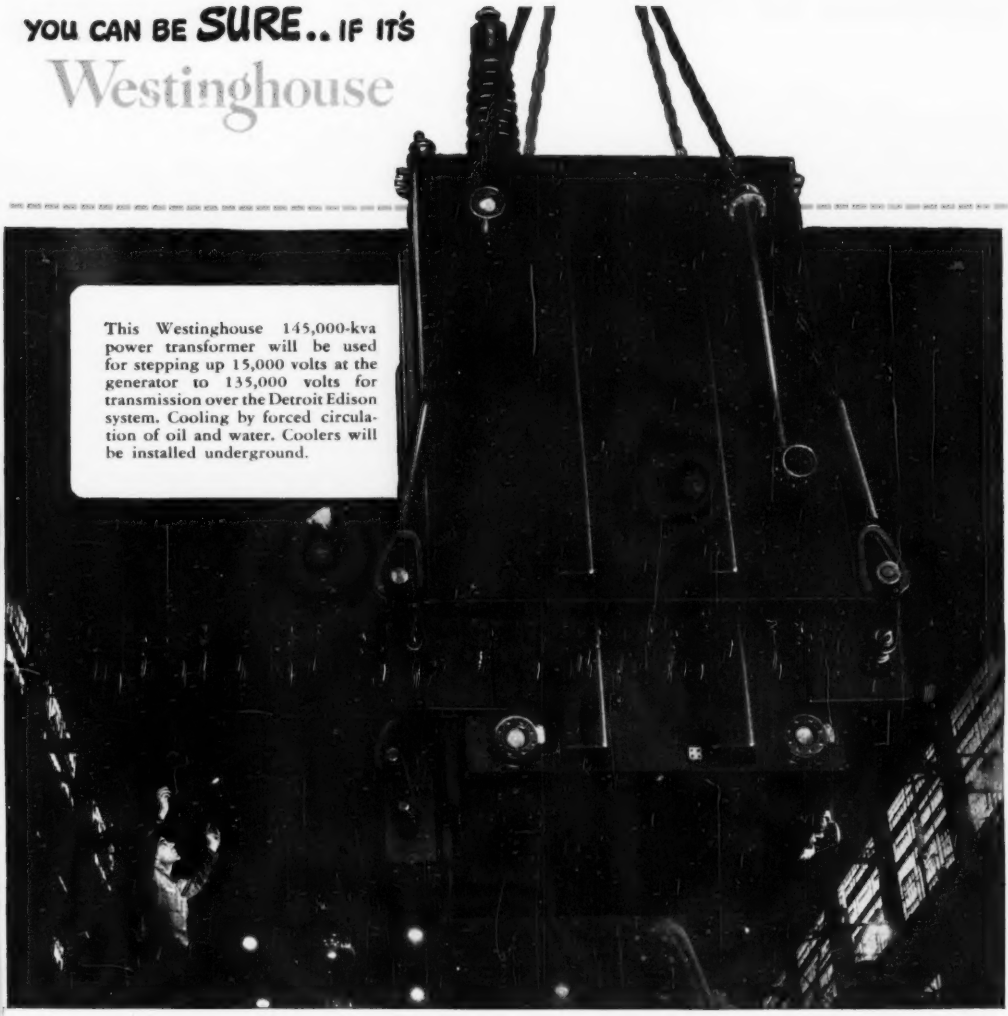
Specify the PENTAchlorophenol treatment for safeguarding *your* poles and other wood construction.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW
penta-
chlorophenol

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



This Westinghouse 145,000-kva power transformer will be used for stepping up 15,000 volts at the generator to 135,000 volts for transmission over the Detroit Edison system. Cooling by forced circulation of oil and water. Coolers will be installed underground.

New Developments for Power Transformers of All Sizes

Mechanical Relief Device—relieves abnormal internal pressures more dependably than diaphragm devices and, for the first time, provides accurate and adjustable tripping characteristics.

Type TRO Thermal Relay—introduced to permit accurate thermal calibration and control; fully accessible without breaking transformer seal.

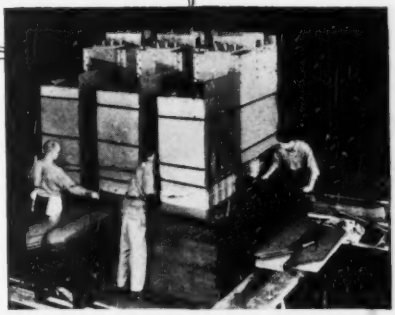
Bracket-Mounted Wheels—permitting a 90° change in direction of movement, usually eliminate need for transfer truck.

Thermosiphon Oil Conditioner—when provided, maintains properties of oil, automatically and constantly.

Type URS Load Tap Changer just announced for moderate ratings; less maintenance, more positive in action and more dependable.

the world's most powerful transformer is Westinghouse

STANDARD-TYPE CONSTRUCTION



Shell-form construction helps to keep transformers small and light . . facilitates a design which withstands high impulse voltages.

Of many interesting facts about the world's most powerful transformer, this one is the most important to you:

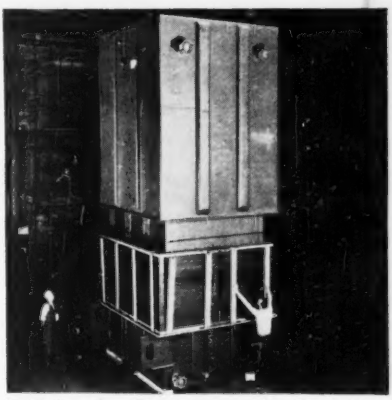
The big unit—from base to bushings—is of standard-type Westinghouse construction!

For purchasers of Westinghouse power transformers, this means extra reliability. For when you buy Westinghouse shell-form, form-fit transformers, you get a design which has proved itself for the largest kv and kva. Or, if your needs call for smaller core-form transformers, you are assured of the same skillful engineering which created the largest.

In producing this remarkable power transformer, no special engineering, special tools or techniques were necessary. The standard shell-form construction with form-fit tank is of such advanced design that it is readily applicable to the Central Station Industry's highest rating requirements now or in the foreseeable future.

Reliable standard construction—suitable to your specific needs—is one way of expressing the standard we sell by.

J-70541



With form-fit tank, you can untank without lifting heavy core-and-coils . . . and in less space.

Westinghouse
TRANSFORMERS

may save you 150 Dollars!

49 CENTS MORE THAN AN UNTREATED CROSSARM . . . that's all the premium you pay to purchase the average crossarm that has been *pressure-treated* with Koppers Creosote . . . that has been protected against decay . . . that will last, on the average, about twice as long as an untreated arm.

Untreated fir crossarms usually last for only 15 or 20 years. Koppers Pressure-Creosoted Crossarms have a life expectancy similar to Koppers Full-Length Pressure-Creosoted Poles. Obviously, by using crossarms that last as long as poles, you can effect substantial savings.

That's not all! If an untreated crossarm, weakened by decay, goes out of service during a storm or at night, it may cost you as much as $150.00 to make the replacement. Not to mention the hazard to linemen . . . the interrupted service . . . the loss of revenue. Yes—from every point of view, it pays to purchase Koppers Pressure-Creosoted Crossarms.

Deliveries of Koppers Pressure-Creosoted Crossarms and Poles are made from conveniently located treating plants.

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

KOPPERS **PRESSURE-CREOSOTED WOOD**

normal current rating, with limit of 100,000 amp. Mounting dimensions and terminal locations are the same for entire line.

Through-type units are rated 800 to 8,000 amp. Foot mounting is specified for vertical or horizontal bars; face mounting for bars entering through panel.

•

Building Wire Compound

FOR USE as general-purpose, building wire insulation, Vinylite plastic electrical compound, VG-5911 Series, has been announced by Bakelite Corp, 30 E. 42nd St, New York 17, N. Y. It is a stock compound to be available in full range of NEMA colors. The manufacturer advises that excellent color retention during hot processing has been obtained.

Underwriters' Laboratories have found this compound suitable for Types T and TW and for use when exposed to oil up to 60 C. Some tentative properties of VG-5911 as determined by Bakelite Corp are included in the table.

Properties of Vinylite VG-5911

D-c resistance (on discs), 50 C	1.2x10⁶ megohm-cm
Conditioned for 1 hr in 60 C water	
Specific gravity	1.33
Tensile strength at 25 C[1]	2990 psi
Ultimate elongation at 25 C[1]	160%
Brittle temp	−18 C
Fracture temp (Tf%)	−25 C
Power factor at 25 C	
(60 cycles)	0.144
(1000 cycles)	0.109
Dielectric constant	
(60 cycles)	8.3
(1000 cycles)	5.8

[1] Aged 7 days at 100 C

•

Fluorescent Luminaire

Featuring luminous metal or plastic side shielding, this fluorescent luminaire mounts two 96-in. T/8 or T/12

slimline lamps. Type PC-290 has been designed for office, school or store installations by Keystone Electric Mfg Co, 2228 E. Tioga St, Philadelphia 34, Pa.

Louvers are in two sections; release easily and hang from chain while fixture is serviced or they may be completely removed. Luminaire is adaptable

"...galvanized conduit corroded" so they switched to ROCKBESTOS A.V.C.

Inner protective impregnated asbestos wall
High dielectric varnished cambric tapes
Outer protective impregnated asbestos wall

THE AVC SANDWICH

High dielectric tapes sealed from air by two asbestos insulating walls.

Where moisture, fumes and heat corroded galvanized conduit, a large Mid-western electric utility replaced ordinary rubber covered cables with this Rockbestos AVC.

The circuits were in a damp, low ceiling basement area adjacent to open ash hoppers and exposed to ash discharge belt conveyors. Moisture, heat, sulphur and other coal gasses corroded the galvanized conduit before it was covered with asphalt paint.

This company chose and installed Rockbestos AVC because its impregnated felted asbestos insulation forms impervious barriers protecting the high dielectric varnished cambric tapes from conditions that destroy ordinary insulations.

Another case where "low-cost" cables cost more in the end . . . where a switch to ROCKBESTOS AVC meant dependability—and *true economy*. Rockbestos AVC is doing the job.

You'll want to know the full Rockbestos Story — Write.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

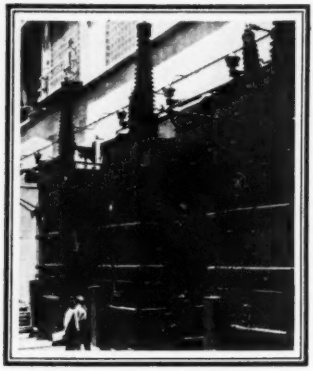
NEW YORK CLEVELAND DETROIT CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CALIF.

WIRES and CABLES by

ROCKBESTOS

....dare to be better

WHY TAKE THAT CHANCE?



There *may* be only one chance in a thousand that *your* big power transformers will ever suffer a fire loss. But it is so simple and inexpensive to have automatic protection against that loss.

Blaw-Knox Automatic Fog Transformer Protection Systems* are electro-thermostatically controlled. When fire danger approaches, they instantly release a cooling, quenching cloud of fog and spray. They save adjacent transformers, switch gear, and nearby structures.

Blaw-Knox protection now means for the future reduced danger, minimum losses, and a quicker return to service if fire should strike.

ASK FOR BULLETIN No. 2207

STANDARD HEAD

Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

*ALSO—
Blaw-Knox offers Standard Wet and Dry Pipe Systems, as well as Thermostatically Controlled and Supervised Deluge Systems.

FOG NOZZLE

BLAW-KNOX
SPRINKLER DIVISION
829 Beaver Ave., N. S.
Pittsburgh 12, Pa.

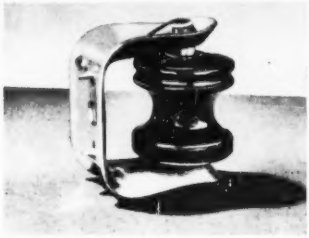
to individual or continuous, flush or pendant mounting. It is furnished wired with high power factor ballast and lamp holders for 110–125-v, 60-cycle operation.

•

Secondary Rack

ONE-POINT secondary rack which eliminates conventional cotter key and reduces installation time is available from Electrical Mfg Co, Box 217, Battle Creek, Mich. It is called No. 699 Quick-Lok-Rak.

It is reported that spool may be changed at least 12 times without damage to integral cotter bolt retainer. Broad curved back assures snug fit on poles, yet mounts solidly on flat surfaces.



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Heavy-Duty Capacitor

HEAVY-DUTY, discharge type capacitors, Type AVL 3204, are manufactured by Cornell-Dubilier Electric Corp, South Plainfield, N. J. Capacity and voltage ratings available are 20,000 μf and 150 v (working).

Features of the unit include: Copper bus bars and heavy wire leads; housing of heavy gage steel; and individual capacitors housed in hermetically sealed, insulated aluminum containers. Overall dimensions of the rectangular case are 6x8x11 in.

•

Current-Limiting Device

A CURRENT-LIMITING device designed to limit development of short circuits on low-voltage systems to a low value, the Amp-trap is made by The Chase-Shawmut Co, Newburyport, Mass. It can be used to protect metal-clad switchgear, bus-ducts, circuit breakers, fuses and current transformers. The Amp-trap is also made as a disconnecting device.

Characteristics of this device include: High interrupting ability independent of current-carrying ability; actuation as fast as the circuit is fast; and selectivity of different ampere ratings said to be accurately and uniformly attained. A 20-amp, 600-v unit (half the size of a cigarette) can tap a feeder directly off a bus capable of delivering a 100,000-amp short.

Amp-traps are available in all ampere sizes from ¼ to 4,000 amp, for a-c circuits up to 600 v (any frequency) and d-c systems up to 750 v.

•

Solenoid-Operated Switch

SYNCHRONIZED CONTROL of two separate circuits in current control applications is provided by a solenoid-operated switch made by Soreng Mfg Corp, 1901 Clyborn Ave, Chicago 14, Ill.

Unit consists of normally open dpst switch with Soreng type TT solenoid as the actuating unit. With minor changes, switch can be furnished in normally closed type. Other features are totally enclosed contacts, high current-carrying capacity, small size, high contact pressures and large area, double break contacts.

According to the company, standard unit worked perfectly after 100,000 actuations carrying 25 amp at 250 v a-c.

•

Indicating Controller

FOR MEASURING and controlling such process variables as temperature, voltage, amperage, pressure and speed, an indicating controller named Multi-Switch Capacitrol has been developed by Wheelco Instruments Co, 847 W. Harrison St, Chicago 7, Ill.

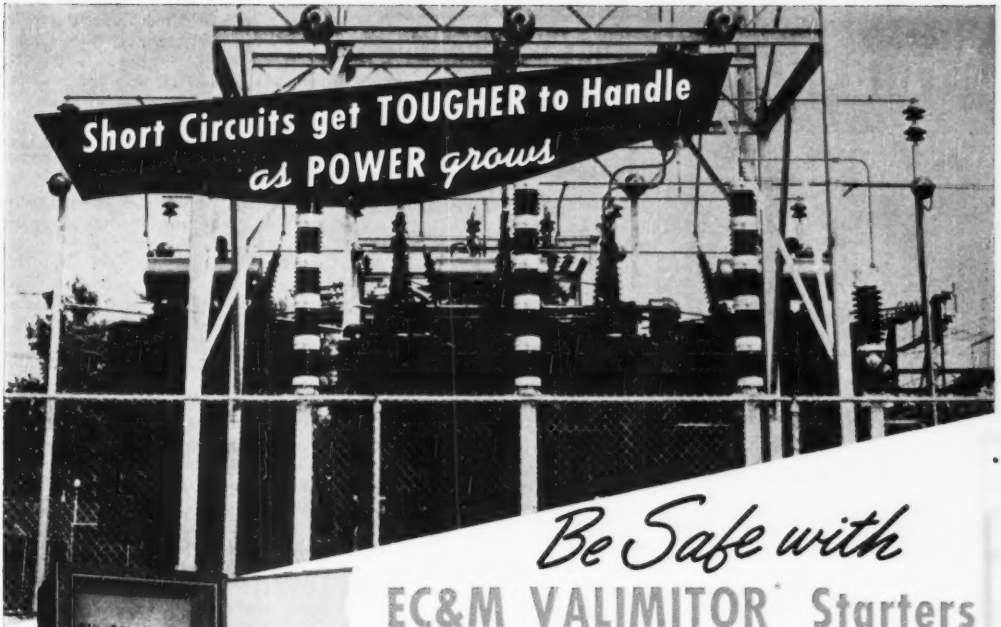
Incorporating such features as a distant view scale, front accessibility, plug-in chassis design and voltage selector plug, the Capacitrol is available with a maximum of four switches (spdt) for selecting six switching sequences for a variety of control functions. A high-resistance, fully compensated, direct-reading meter movement with Alnico V magnet is used in the pyrometric range. Models with resistance thermometer measuring systems are available for low temperature operation.

•

Selenium Rectifier Cells

HIGH-VOLTAGE selenium rectifier cells are announced by Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa. These cells may be used in electrostatic precipitator power supplies, industrial supplies for electronic control and radio transmitters.

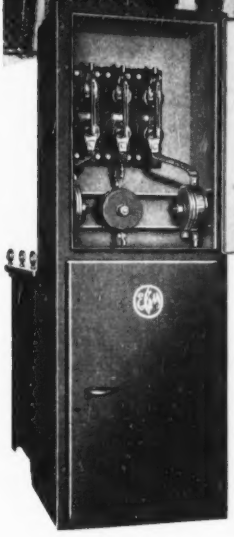
They are designed for a d-c voltage of 24 v per cell, with an a-c voltage (rms) of 33 v per cell for 1-ph bridge circuits. Availability covers round sizes from 1 to 4^3/$_8$ in. in diam, and 5-in. square and 4^1/$_4$x6-in. sizes.

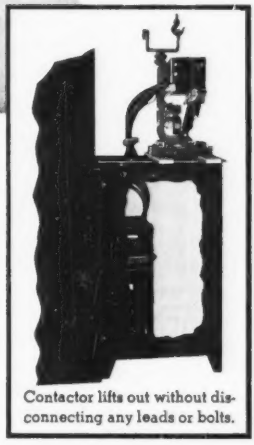


Be Safe with EC&M VALIMITOR* Starters

PROTECTION IS PERMANENT and at ONE cost

*Trade Mark (Volt-Ampere-Limitor)



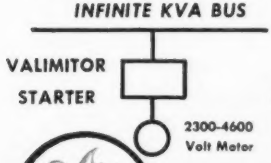


Contactor lifts out without disconnecting any leads or bolts.

As you plan 2300-4600 volt motor protection, bear in mind the growing demand for electrical power. Your own additions or increased demand by neighbors may raise increasing-power capability. In the next few years, over 15-million KW capacity will have been added to central station generating-systems.

Don't be caught "short" with a "short" your equipment can't handle with safety. Use EC&M VALIMITOR Starters for *permanent* protection. They eliminate the guesswork in interrupting capacity needed—the bus to which they are connected can be of *any* capacity—the KVA may be infinite. When a fault occurs, there's nothing to replace—just press the start button to re-start.

EC&M Valimitor Starters are easy to apply. Only the usual motor characteristics (size, voltage, etc.) are needed to build VALIMITOR Starters. They are designed for *unlimited* protection, regardless of available KVA. For permanent safety, specify EC&M VALIMITOR Starters.



There's "No Ceiling" on **VALIMITOR Protection**

Write for No. 23 Issue of "The EC&M ACCELERATOR" completely describing VALIMITOR Starters

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

ArmaWind

AW

Transformer

Cooling

Fan

F.O.B. $55.00 INCLUDES TAX

MATERIALS: G. E. ¼ H.P., 115 V., 1 Phase, motor for outdoor service. Sealed ball bearings. Water slinger on shaft. 2 ft. Geoprene leads. 18" steel, 3 blade, Cadmium plated fan. Spot welded guard of ¼" steel rod. Baked enamel finish. Shipping wt. 60 lbs.

ACTION: A long life fan of engineered design, that delivers a high velocity volume. Air Movement 8,513 C.F.M. 6 ft. from blade, with Average Velocity of 537 ft. per minute over 4'6" Diameter Circle. Easily carried by one man. Quick adjustment of fan angle—from 30 degrees below horizontal to vertical. Can be mounted permanently on a pipe structure.

RESULTS: ArmaWind Transformer Cooling Fans have "stood up" for 15 years. One utility company has purchased over 1500. Many satisfied users. Prompt shipment—from our plant to you.

Also, Makers of Man Cooling Fans.

Armature Winding Co.

Charlotte, N. C.

MORE NEW PRODUCTS
about which you should know

Beaver Pipe Tools, Dana Ave, Warren, Ohio, has an improved **pipe threader** for cutting either standard taper or straight electrical conduit threads on 1, 1¼, and 1½ and 2-in. pipe with a single set of dies; ask for Catalog No. 48. . . . General Machine & Welding Works, 1100 E. Second St, Pomona, Calif., has available angular thrust, ball bearing **swivels** which prevent twisting and kinking of lines in strung hoisting blocks. . . . Stone Mfg Co, Elizabeth, N. J., has aluminum **glare shields** for sealed beam lighting, the D-200, to be used with their entire line of lamp holders.

Laminated Plastics, Inc, 14838 Euclid Ave, Ceveland 12, Ohio, has announced a series of heavy-duty, Fiberglas-reinforced electrical **insulating laminates** having all requirements of high-impact class B insulating plate materials plus flame resistance, in 36 x 48-in. sheets of several thicknesses. . . . Schori Process Division, Ferro-Co Corp, 8-11 43rd Rd, Long Island City 1, N. Y., has developed a flame spray **powder pistol** which sprays any powdered metal or thermoplastic resin or combination of both.

Bauer & Black, Dept F, 222 W. Adams St, Chicago, Ill., announces a plastic-backed, adhesive **electrical tape**, Polyken No. 822, with a dielectric strength of over 10,000 v and characteristics of its parent material, polyethylene. . . . The Miskella Infra-Red Co, Cleveland 4, Ohio, manufactures Spir-O-Therm insulated **infra-red units** (lampless) in ratings ¾ to 4½ kw for 115 or 230-v operation. . . . Western Lithograph Co, 220 Rose St, Los Angeles 54, Calif., has self-adhesive black-on-white **terminal markers** called Spot-It in numeral series 1 to 10/20/40 and letter series A to Z.

Superior Electric Co, Hannon Ave, Bristol, Conn., is producing Type D850H **dimmers** with capacity of 0 to 850 w from a 115-v, 50/60-cycle, 1-ph source; have vertically operated handle and graduated drum markings. . . . BullDog Electric Products, Box 177, Roosevelt Park Annex, Detroit 32, Mich., has announced a series of four, six and eight-plug, fuse branch **circuit cabinets** in its Main, Range, and Lighting Panel line, which have solderless, pressure type wiring terminals.

Slicon Textile Inc, 24 Edison Place, Newark 2, N. J., is offering **plastic flags**, made of vinyldene chloride film, which are highly resistant to weather-wear, color fast, dimensionally stable and have metal stiffening bar; can be imprinted as desired with "Danger", "Men Working" etc. . . . Rome Cable Corp, Rome, N. Y., has available polyethylene ornamental **pole and bracket cable**, RoLene, in sizes 10, 8 and 6 AWG. . . . General Electric Co's Welding Divisions, Schenectady 5, N. Y., are producing Inert-Arc **electrode holders** in 100, 200, 400 and 800-amp ratings for manual holders and 400 and 800-amp ratings for machine welding holders.

Aero-Motive Mfg Co, 1803 Alcott St, Kalamazoo 24, Mich., has developed an **electric cord reel** and trouble lamp which features a rugged internal lock and retrieving mechanism, swivel mounting bracket, and either 25 or 45 feet of cord. . . . The Ward Leonard Electric Co, Mount Vernon, N. Y., is manufacturing Bulletin 3151, Size 0 and 1 a-c manual, across-the-line **starters** for single or polyphase motors, available in two, three and four pole forms. . . . Bauer & Black, Industrial Adhesive Tape Dept F, 222 W. Adams St, Chicago 6, Ill., announces No. 163 electrical **adhesive tape** reported to outperform ASTM friction tape in more than eight ways.

General Electric Co's Lamp Dept, Nela Park, Cleveland 12, Ohio, has available two **infra-red lamps** for industrial processing—a 500-w globe-shaped type and a 375-w lamp with self-contained reflector and heat-resistant bulb. . . . Professional Mfg Co, Chicago, Ill., has light-weight **metal ladders**, called Util-Ladders, with side rails curved at the top which hold them away from supporting surfaces. . . . Irvington Varnish & Insulator Co, Irvington 11, N. J., has a new Class B, varnished Fiberglas **insulating material**, Style OW, in thickness of 0.007, 0.010 and 0.012 in., available in rolls, tapes and punchings.

Thermador Electrical Mfg Co, Inc, is manufacturing a **recirculating pump**, No. P-1, capable of pumping 7 2/3 gpm against a 2-ft head operating from a 115-v, 60-cycle supply. . . . A. B. Chance Co, Centralia, Mo., announces a hardwood **pole guard** for removing or replacing poles from lines carrying 45 kv between phases; is easily assembled and disassembled. . . . Metron Instrument Co, 432 Lincoln St, Denver 9, Colo, now produces Type 48K **tachometer** which has ten speed ranges, without adapters, of from 360 to 4,000 rpm.

The Yale & Towne Mfg Co, Philadelphia Div, announces an electric **forktruck**, the "Bunnyhugger", which has forks that grasp loads with a pincer-like movement; has a capacity of 3,750 lb. . . . Sylvania Electric Products Inc, Salem, Mass., is offering a yellow **ceramic lamp**, the Anti-Insect Lite, with weather-resistant coating in 25, 60 and 100-w sizes. . . .

Keeping stainless steel STAINLESS

. . . a typical problem in fabricating alloy piping

Heat a piece of stainless steel pipe to bend it and right away you're up to your ears in metallurgical complications. To begin with, stainless steel isn't just one alloy. There are hundreds of different types of stainless steel, each selected for its resistance to corrosion or its stability at high temperatures. To maintain the metallurgical properties which dictate the choice of a particular alloy steel, you have to know the temperature range within which this steel may suffer excessive metallurgical changes. And you have to have specialized equipment to maintain the precise control necessary to avoid these hazards.

Grinnell pipe fabrication equipment includes specially designed gas-fired radiant heat furnaces for this precisely controlled heat treatment of stainless steels and other alloy steels. Multiple burners are strategically located to distribute temperature uniformly and to prevent harmful flame impingement. Precision instruments regulate temperature and time.

It's an intricate business . . . fabricating alloy steel piping. It's a job for Grinnell prefabricating plants because Grinnell has the equipment and modern methods, the interpretive engineering, the metallurgical research facilities and the skilled personnel.

99 YEARS PIPING

GRINNELL

Grinnell Company, Inc., Providence 1, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

How to streamline Your Steel Inventory

During the past period, steel users naturally have been most interested in getting the steel they needed without too much emphasis on quality. Inventories were built up as much as possible because of excessive demand and uncertain supply.

Now, the time has come when industry can begin to streamline inventories and can place more emphasis on quality. While a few products remain on the critical list, a balance between supply and demand has been reached for most steels. Under these conditions, yesterday's "normal" inventory may loom large and steels of doubtful ancestry may prove a liability.

We are glad to be in a position again to recommend that you keep your inventory at a practical working level and use our warehouse stocks as your inventory reserve. The many Ryerson Steel-Service Plants throughout the country are particularly well equipped to help you keep your inventory streamlined. Carbon, alloy and stainless steels in thousands of analyses, shapes and sizes are ready for quick shipment—and their uniform high quality is assured by our Ryerson Certified Steel Plan.

So don't let changes in market conditions or product design catch you with high inventories. As warehouse stocks improve we suggest that you extend a conservative buying policy over an increasing range of your steel requirements and keep in touch with us for your current needs.

PRINCIPAL PRODUCTS

BARS—carbon & alloy, hot rolled & cold finished
SHAFTING—cold finished, ground & polished, etc.
STRUCTURALS—channels, angles, beams, etc.
PLATES—sheared & U. M., Inland 4-Way Floor Plate
SHEETS—hot & cold rolled, many types & coatings
TUBING—seamless & welded, mechanical & boiler tubes
STAINLESS—Allegheny bars, plates, sheets, etc.
REINFORCING—bars and accessories
MACHINERY & TOOLS—for metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI
CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

NEWS ABOUT PEOPLE

Allentown Utility Elects Three Vice-Presidents

Announcement has been made by the Pennsylvania Power & Light Co, Allentown, of the appointment of three vice-presidents.

G. Theodore Storb, formerly PP&L division head, has been made vice-president of the company's Lancaster

G. THEODORE STORB

division; J. C. Knowles, vice-president of the newly formed Lehigh division in the merging of two of the utility's major commercial divisions; and James M. Huebner has been appointed vice-president in charge of commercial operations.

J. C. KNOWLES

Mr Storb joined predecessor companies of PP&L in 1923. In 1925 he became statistician for these predecessor companies, the Edison Electric Co and the Lancaster Gas Light & Fuel Co, and three years later was made chief engineer. Upon merger of the two organizations with PP&L in 1930, he became distribution engineer. Lancaster division, in 1939 division commercial manager and in 1944 division manager at Allentown.

JAMES M. HUEBNER

Mr Knowles joined PP&L in 1924 and, leaving in 1928 to become electrical engineer for Monongahela West Penn Public Service, he rejoined PP&L in 1932. He has been identified with the Williamsport district and the Susquehanna and Bethlehem divisions. After service in World War I, he spent several years with eastern utilities prior to joining PP&L.

Mr Huebner was a division vice-president at Lancaster at the time of his new assignment. He joined PP&L in 1924 in the line department, and served as a district manager and later division manager at Bethlehem. Earlier in his career he was associated with the Carnegie Institute of Research, Washington, D. C., and the Phoenix Utility Co.

L. W. Heath, formerly vice-president in charge of commercial operations, has been assigned special executive duties.

•

H. W. Pfeffer, Struthers-Dunn, Inc, Philadelphia, has been elected president of the National Association of Relay Manufacturers. **H. L. Huntsinger,** of the RMB Division of the Essex Wire Corp, was named vice-president and **J. V. Roughan,** Price Electric Corp, is secretary-treasurer.

General Electric Makes Engineering Appointments

Announcement has been made of the appointment of **W. J. McLachlan** as manager of the central station engineer-

W. J. McLACHLAN

ing divisions, General Electric Co, Schenectady, to succeed **D. M. Jones,** who has retired after 32 years' service with the company. Mr McLachlan joined GE in 1924. He engaged in distribution-system engineering and later served as engineer of the product division. He has been assistant manager of the divisions since 1947. Mr Jones had been manager of the central station en-

HAROLD E. STRANG

gineering divisions for the past 11 years.

Harold E. Strang, engineering manager of the affiliated manufacturing companies department, Schenectady,

Built for Professional Mechanics . . . .

Snap-on Wrench Sets

give you a lot more for your money!

Here's the ideal starter set for the alert mechanic. It has a basic selection of ½" square drive Snap-on "Matched Unit" wrenches, of the exact quality used by professional mechanics.

They're precision engineered for absolute accuracy . . . machined from fine alloy steels, and heat treated for toughness and hardness.

The set includes 19 tools; an 18" nut spinner, ratchet wrench, 5" and 10" extension bars, and 15 popular sizes of sockets from 7/16" to 1-1/4". Complete in a red enameled heavy-gauge metal box with plenty of room for additional tools. 319-M-B Basic Master Set. **$29.90**

PLUS additional correct amount for Tax on Sales if required by your State or City.

Supplement your Basic Set with these Matched Units

Ratchet Adaptor
Converts any combination of handle extension and socket into a ratcheting tool.

Hexagon Flexockets
Sockets with built-in universal joints — reach around obstructions to turn nuts. Sizes range from 9/16" to 7/8".

Deep Hexagon Sockets
Gives you additional clearance to service spark plugs, spring "U" bolts and nuts set deep overbolts. Sizes 1/2" to 1-1/8".

Speeder Handle
Spins nuts on or off in a hurry! Both handle-grips swivel for easy operation. Overall length 18-3/4".

GENUINE Snap-on Tools can be bought only from Snap-on branch sales offices and field men or Direct-by-Mail.

Mail This Coupon Today!

Snap-on Tools Corporation, 8108-G 28th Ave., Kenosha, Wisconsin

Enclosed find ☐ check ☐ money order, or ☐ Company Purchase Order for the $29.90 Master Basic Set. ☐ Please send illustrated brochure describing 105 Snap-on Master Series Wrenches and Sets.

Name.....

Address.....

City.....State.....

has been made manager of the apparatus department's meter and instrument divisions of Lynn, Mass., to succeed Nicholas M. DuChemin, who recently became assistant general manager of the department. Since joining GE in 1922, Mr Strang has had engineering assignments in Schenectady and Philadelphia and on the staff of the vice-president in charge of design engineering for the apparatus department.

W. F. Rauber has been appointed manager of sales for the switchgear divisions, apparatus department, Philadelphia. Formerly assistant manager, Mr Rauber succeeds **J. D. Hoffman**, who has been appointed sales manager of the air conditioning and commercial refrigeration division of the air conditioning department, Bloomfield, N. J.

S. W. Corbin has been appointed assistant manager of the industrial divisions. Mr. Corbin also is manager of the resale industries division, and will retain this position along with his new appointment.

James H. Goss has assumed the duties of manager of engineering in the control divisions. He has been assistant manager since 1947.

Paul J. McMahon has been made assistant superintendent of the power transformer manufacturing division, Pittsfield, Mass., and is delegated to supervise the production functions in the division. Mr McMahon has been production supervisor of the division since 1948.

Joseph P. Coughlin has been appointed assistant manager of the specialty transformer sales division, specialty transformer and ballast divisions. During the past five years, Mr Coughlin has been closely associated with the design and sale of ignition transformers for oil burners, aircraft transformers and machine tool transformers.

Francis K. McCune, assistant to the general manager of the apparatus department, has been appointed assistant general manager of the nucleonics department. Mr McCune's headquarters are at Richland, Wash., where the nucleonics department operates the Hanford Works for AEC. A GE employee since 1928, he was assigned to the apparatus department's design engineering staff in 1946 and two years later was named assistant to the general manager of that department.

O. H. Young, who has been assistant to P. D. Parker, general sales manager of the lamp department at Nela Park, has been advanced to the position of assistant manager of the general sales division, lamp department. Mr Young has been at Nela Park since 1931.

Lyde E. Howard, formerly assistant manager for cable sales, apparatus department, has been made sales man-

PREMAX

Reduce Labor Costs With Metal Markers

Any public utility can reduce installation and maintenance costs in property marking for identification by abolishing the old, costly method of stenciling and substituting Premax Stamped and Embossed Metal Letters, Figures and Tags. Cost less to install . . . last as long as the average pole.

Write today for illustrated booklet showing how the Premax method is saving money for other utilities.

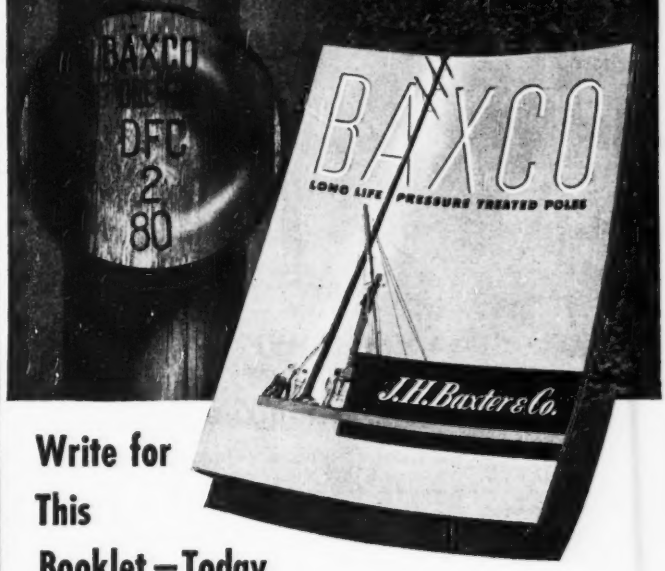
PREMAX PRODUCTS
DIVISION CHISHOLM-RYDER CO., INC.
4948 Highland Ave., Niagara Falls, N. Y.

All the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

QUALITY POLES
from the forests of Oregon



Write for This Booklet—Today

If you order, specify or purchase telephone or powerline poles you want to *be sure* that you're getting the *best value* on the market, don't you? Then, by all means, write today for the above BAXCO booklet.

For over 50 years J. H. Baxter & Co. with its Associated Pacific Coast Companies have been supplying the world's finest poles to users throughout the United States. We can make prompt shipments from our complete stocks of BAXCO Long-Life Douglas Fir pressure treated poles—and in all lengths up to 125 feet.

To learn why these poles are longer lasting, more economical to buy—why Baxco offers the best and most for your money—write today for the BAXCO booklet.

J.H.Baxter&Co.
333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
ASSOCIATED COMPANY: J. H. BAXTER & CO. OF OREGON

EXPERIENCED ENGINEERING DEVELOPS NEW, QUICK-ACTING FIRE EXTINGUISHER

TESTS

and more

tests

TESTS!

Now ready!

C-O-TWO
DRY CHEMICAL TYPE
FIRE EXTINGUISHER

Test after test, changes, improvements, simplifications . . . now the new C-O-TWO Dry Chemical Type Fire Extinguisher is ready, having features that make it one of the most efficient, fool-proof, easy-to-use fire extinguishers known.

SELF-CONTAINED UNIT... no extra gadgets protruding or complicated operating instructions . . . a real down-to-earth fire extinguisher that does a highly efficient job.

C-O-TWO DRY CHEMICAL IS FREE FLOWING . . . no syphon tubes or valves within the cylinder to become clogged or inoperative . . . special dry chemical formula developed to ensure proper flow . . . discharge hose and nozzle remain empty until fire extinguisher is actuated.

TWO CONVENIENT SIZES to fit your fire fighting needs... 20 pound capacity and 30 pound capacity . . . both engineered for fast, positive action the instant fire strikes.

APPROVED . . . Underwriters' Laboratories, Inc. rating is B-1, C-1. C-O-TWO Dry Chemical is non-conducting, non-corrosive, non-freezing and non-toxic . . . highly effective on flammable liquid and electrical fires.

ON-THE-SPOT RECHARGING . . no special tools needed... C-O-TWO Dry Chemical for recharging is sold in handy pre-measured 20 and 30 pound sizes as well as in a 50 pound bulk size . . . all sizes packed in durable moisture proof containers.

Act now for complete free information on our newest contribution to modern fire fighting. Remember fire doesn't wait . . . write us today . . . no obligation.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

ager, electric utility sales, wire and cable division, with headquarters in Schenectady. **Jame F. Farnam,** formerly sales manager of Bridgeport wire and cable division, construction materials department, has been named sales manager, industrial and contractor sales, wire and cable division, with headquarters at Bridgeport.

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R. N. Larkin Joins Staff, Engineering News-Record

Richard N. Larkin, since late 1946 an associate editor of ELECTRICAL WORLD, joined the staff of *Engineering News-Record* July 1. As associate editor of ELECTRICAL WORLD, Mr Larkin was responsible for news coverage, involving the political, economic, labor, and social concerns of the electrical industry and was editor of the column, "In the Industry." Before becoming associate editor, he was Electrical World's Washington correspondent for four years.

Mr Larkin has had considerable experience in news reporting. He served on the staff of the *Morning Free Press*, Easton, Pa., and of the *Patriot*, Harrisburg, Pa., and then joined the Harrisburg bureau of the United Press, covering Capitol Hill, including the statehouse, the Public Utility Commission, and other departments of the state government. He became identified with the McGraw-Hill Publishing Co in New York as a member of the staff of *Product Engineering* in 1942. His assignment to the McGraw-Hill News Bureau in Washington followed shortly thereafter.

•

Walter F. Chapman, who has been associated with the San Diego Gas & Electric Co in various capacities since 1922, has been appointed commercial manager of the company. Prior to his promotion, Mr Chapman was serving as superintendent of the customer extensions department. He succeeds H. G. Dillin, who was chosen vice president in charge of sales, EW, May 14, p 27.

Norman T. Smith, who has been active in the electrical engineering field in his native England for the past 20 years, has been appointed general manager of the Nova Scotia Light & Power Co, Ltd, Halifax, N. S. At Halifax, Mr Smith succeeds **J. B. Hayes,** who retired several months ago because of ill health. Mr Hayes had held the position for many years.

C. C. Carr has retired as director of public relations and advertising for the Aluminum Co of America. **Arthur P. Hall,** assistant director since 1947, has been named to succeed him. Mr Carr,

who joined Alcoa in 1934, will become a public relations consultant. Mr Hall has been associated with Alcoa for 20 years.

OBITUARY

Basil G. Kodjbanoff, retired vice-president and manager of the eastern division of the Benjamin Electric Mfg Co, Des Plaines, Ill., died on June 8 in New York after a two-month illness. He was 71 years old. Mr Kodjbanoff joined Benjamin Electric in 1903 and opened its New York warehouse and sales office. He continued to manage the eastern division until his retirement in 1942. Mr Kodjbanoff was closely identified with the development of the lighting industry and the electrical industry generally. A native of Yugoslavia, he came to this country at the age of 16. He obtained his engineering degree at Lehigh University and was identified with the sales organization of the Holophane Glass Co before his association with Benjamin Electric.

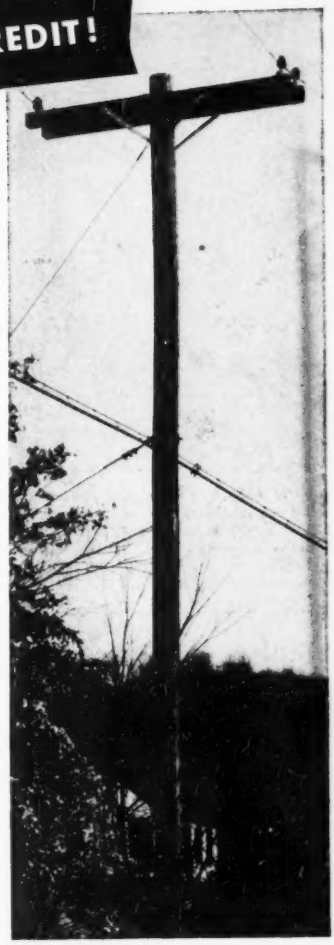
Raymond R. Stoddard, an industrial power engineer for the past five years for the Concord, N. H., Electric Co, Fitchburg, Mass., Gas & Electric Light Co, Rockland, N. Y., Light & Power Co, and other utilities with headquarters at Boston, Mass., died at Newton, Mass., June 16. He was an electrical engineering graduate of the Massachusetts Institute of Technology and held a degree from the Philadelphia College of Law. Formerly he had been employed by the Philadelphia Electric Co, and at one time was patent attorney for the Sperry Gyroscope Co.

Grover C. Meyer, electrical engineer for the Kansas City, Mo., Power & Light Co, and a nationally-known consultant on the milling and grain industries, died on June 1 after an illness of six weeks. He was 56 years old. A native of Higginsville, Mo., Mr Meyer became identified with the Kansas City utility in 1912. A paper he prepared on "Power Requirements in a Flour Mill" established him as an authority on this subject. Mr Meyer was a member of the American Institute of Electrical Engineers.

Joseph E. Mercure, 62, safety engineer of the Pittsfield, Mass., Works of the General Electric Co, died at Albany, N. Y., on June 8. He joined the company in 1912 and at various times was active on construction projects in India, Japan and Russia, as well as in transformer engineering at Pittsfield. For the past 12 years he had specialized in safety engineering, including the company plants at Fort Edward and Holyoke as well as Pittsfield.

CASE HISTORY
confirms 30-year service life for treated poles

...AND CREOSOTE GETS THE CREDIT!



HERE's a convincing case history* concerning 71 pressure-creosoted pine poles—part of an electric power transmission line erected in Kansas in 1917.

In 1947, after 30 years in line, 68 out of 71 poles were still sound and serviceable—furthermore, the inspection revealed that these poles appeared to be capable of service for some time to come. Of the remaining 3 poles, 2 had been removed because of line changes—1 had been damaged by lightning.

Of the original 71 poles, *not a single one had been removed because of decay*—a splendid testimonial to creosote. And all the more noteworthy when you consider that the preservative treatment used to protect these poles was somewhat lighter than is now regarded as good practice.

Creosote is the performance-proved, time-tested preservative for poles and crossarms. And for the best possible creosote delivery service, get in touch with the nation's largest distributor—Koppers. With 14 creosote-producing plants—with 4 large storage plants—Koppers can always meet your creosote requirements.

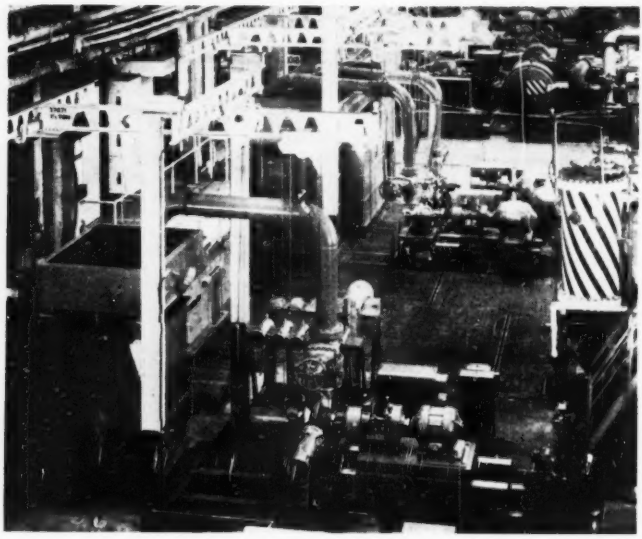
KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.

* Wood Preserving News—1947

All Standard Specifications
For All Types of Wood Preservation

KOPPERS **CREOSOTE...** *to be sure!*

MANUFACTURERS and MARKETS



NEW AND MODERN pump testing facilities with numerous innovations were unveiled at the Allis-Chalmers West Allis plant recently. The new test floor has sufficient capacity to handle 90% of the plant output, and the testing is done by measuring water by weight. Features of the equipment include an electric eye, which controls an air-operated dump valve to dump the water from the scale when the scale pointer cuts the beam of light, and an electronic tachometer, which was built into a torque meter

McGraw Electric Acquires Control of Line Material

McGraw Electric Co, Elgin, Ill., has acquired control of Line Material Co, Milwaukee, according to an announcement by Max McGraw and W. D. Kyle, Jr, respective presidents of the companies.

Merging Line Material into McGraw Electric is contemplated and, if desired by the stockholders, will be made effective. Line Material products are all in the capital goods field, while those of McGraw Electric are aimed principally at the consumer and industrial markets.

The combined sales volume of McGraw Electric and Line Material in 1948 amounted to $75 million, with a net profit after taxes of $8 million. Neither company has now or will have presently any preferred stock outstanding, or funded debt, except a 2% $700,000 term bank loan of Line Material, due serially at the rate of $100,000 per annum, the announcement said.

Line Material stockholders will be given representation on the board of directors of McGraw Electric, and W. D. Kyle, Jr. will remain at the helm of Line Material Co or Division as president and general manager. Max McGraw becomes chairman of the board of Line Material, replacing W. D. Kyle, Sr. who retires from that position but remains available in a consulting capacity. There will be no other change in personnel or method of operation.

•

Universal Sets Up New Portable Appliance Unit

As a part of an aggressive and carefully planned program to intensify selling effort through its distributors and retailers, Landers, Frary & Clark has announced a complete separation of non-electric and portable electric appliance headquarters and field sales organizations and the forming of a new Universal portable electric appliance division, headed by R. M. Oliver, general merchandising manager.

"Plans for a greatly expanded factory sales organization are well underway," Mr Oliver said. The staff has already been increased about 80% and new men are still being taken on for training at the factory before assuming field responsibilities.

In the first 24 weeks of 1949, Universal's sales volume in portable appliances ran 10% ahead of the same period in 1948, despite the general decline in appliance sales, said Mr Oliver. Principal cause for this is the company's Coffeematic, on which intensive promotional effort is being placed.

MANUFACTURING BRIEFS

A nineteen-day recess in wage contract talks was agreed upon last week by representatives of the United Electrical Workers, CIO, and the General Electric Co. The next meeting was set for July 12 "at the union's suggestion," the company announced. Wage talks between Westinghouse and the union recessed until July 6.

Contract amounting to about $2.5 million has been awarded Babcock-Wilcox & Goldie-McCulloch, Ltd, Galt, Ont., by the Ontario Hydro-Electric Power Commission for steam generating units in the proposed $40-million generating plant at Toronto. C. A. Parsons Co, Newcastle-on-Tyne, England, had previously been awarded a contract of about $4 million for turbo-generators for the same project.

Reductions in net prices, ranging from ½% to 7% on polyphase and d-c electric motors and generators from one to 200 hp, will be realized by most purchasers as a result of a new motor and control sales and discount plan announced by the General Electric Co. Reductions represent more than $1 million in annual savings to these purchasers. Larger-sized motors from 51 to 200 hp and d-c motors were placed

on a uniform discount schedule with that established for ratings of polyphase one to 50 hp motors.

Lifting of export quota restrictions from aluminum plate, sheet, and strip for the third and fourth quarters of this year has been announced. For some time the industry had been hoping that the Department of Commerce would take such action. It has contended that the end of the aluminum shortage here a few months ago made the restrictions unnecessary.

A total of 888 individual teaching pictures comprise a series of 12 discussional-type slidefilms on Basic Electricity now available. They are designed for everyday use by instructors in the school shop, for apprentice training, and for foremen's meetings in the electrical, electronics, and allied fields. Detailed information may be obtained from School Service Department, The Jam Handy Organization, 2821 E. Grand Blvd, Detroit 11, Mich.

Recipient of the first annual award for Health Achievement in Industry to be given by the American Association of Industrial Physicians and Surgeons is the Rome Cable Corp, Rome, N. Y.

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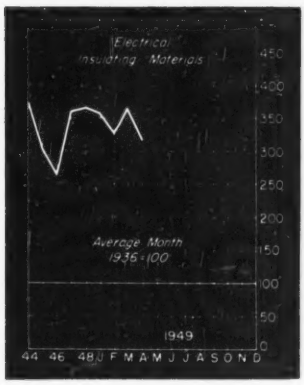
Insulating Materials Sales Drop Sharply in April

Sales billed on electrical insulating materials during the month of April, 1949, dropped sharply from the total



recorded for the preceding month, according to figures released by the National Electrical Manufacturers Association. The NEMA index moved downward to 315 from 366 in March, a decrease of 14%.

In April, 1948, the index stood at 371, this year's figure representing a decrease of 15%.

When dependability comes first, safeguard your vital power arteries with Collyer Cables! On both underground and overhead installations they "come through" with flying colors. All of these rugged cables are easy to install and easy to maintain. Each is designed to perform its specialized service efficiently, year after year. Write for samples and information.

TYPE RR UNDERGROUND NETWORK CABLE

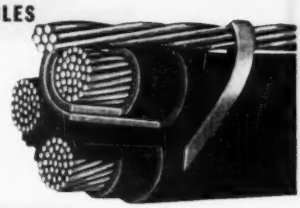
Moisture-resistant rubber insulation and tough neoprene jacket give excellent electrical properties well guarded against chemicals, oils, and abrasion. Underwriters Approved (Type USE). Single and multi-conductor constructions in all sizes.

NEUTRAL-SUPPORTED OVERHEAD CABLE

Two insulated power conductors cabled around bare or insulated messenger. Conductors are rubber insulated and neoprene-jacketed or are covered with insulating neoprene alone. Messenger is the neutral conductor and is of copper or Copperweld, as specified.

SELF-SUPPORTING AERIAL CABLES

Messenger and cable pre-assembled at the factory for easy working on the job. Highly resistant to sunlight, weathering, and abrasion. Single and three-conductor constructions for two voltage classes: 600 V. and 5000 V.

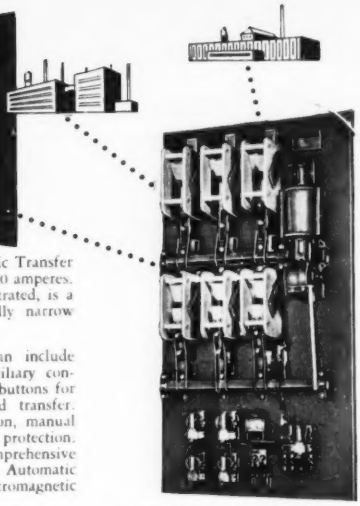


POLYETHYLENE NYLON TREE WIRE

Polyethylene insulation has great dielectric strength. Nylon jacket contributes unsurpassed abrasion resistance plus excellent protection against weathering and longitudinal surface leakage.

Collyer INSULATED WIRE CO.
245 Roosevelt Ave., Pawtucket, R. I.

HEADQUARTERS FOR
AUTOMATIC
TRANSFER
SWITCHES



We can take care of almost any Automatic Transfer Switch requirement ranging from 5 to 1000 amperes. For example, Bulletin 906-105S, as illustrated, is a 300 ampere unit installed in a specially narrow panel for a distribution control center.

Standard features on control panels can include phase failure protection, indicating auxiliary contacts, engine starting contacts and push buttons for engine tests, reset to normal and load transfer. Special features include delayed operation, manual emergency handles, low frequency relay protection. Condensed Catalog No. 700 gives a comprehensive picture of our work along the line of Automatic Transfer Switches and complete Electromagnetic Control Panels.

If you require any type of automatic control, write us. Our 60 odd years of broad experience in the field of Electromagnetic Controls should be helpful.

Automatic Transfer Switches
Remote Control Switches
Contactors Relays
Specialized Electromagnetic Controls

We also manufacture a complete line of Solenoid Operated Valves for Automatic and Remote Control of Liquids and Gases.

ASCA Electro-Magnetic CONTROLS

Automatic Switch Co.
397 LAKESIDE AVENUE · ORANGE, NEW JERSEY

The ONLY FENCE
MADE OF
KONIK STEEL

• Continental Chain Link, the only fence made of KONIK STEEL, gives you greatest protection at lowest cost per year of fence life. KONIK is a patented open hearth steel containing copper, nickel and chromium for greater strength—for extra resistance to rust. In the weaving of Continental Chain Link, the KONIK fabric is dipped in a special galvanizing bath which spreads a uniform coating of weather-proofing zinc over every inch of the fence. It will pay you to contact our nearest representative or call us at Kokomo to learn more about this economical, permanent property protection.

We'll Help You . . .

Our fence engineers stand ready to plan and help erect the type of fence "tailored" to your own property. Continental Chain Link fence gives you 14 distinctive construction advantages including stronger gates . . . pivot-type hinges . . . self-locking barb arms . . . 20% more ties.

CONTINENTAL STEEL
CONTINENTAL STEEL CORPORATION
GENERAL OFFICES · KOKOMO, INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, shapes, tempers and finishes, including Galvanized; KOKOTE, Plain Sealed, Copperized, Tinned, Annealed, Spring Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Arkansas—Woodruff Electric Corp., Augusta, 382 mi. rural distr. lines and imprvs., Woodruff Co., **$740,000.** Ray Channaberry, Washington Bldg., Louisville, Ky., consult. engr.

La., New Orleans—U. S. Eng., foot Prytania St., installing 175 ton, summer air-conditioning sys. in engineering bldgs., Serial No. Eng. 16-047-49-340.

Michigan—Oceana Electric Co-operative, Hart, 30 mi. rural distr. lines, sys. imprvs., 12 mi. tie lines, headquarters facilities, etc., Oceana Co., **$315,000.**

Michigan—Wolverine Electric Co-operative, Newaygo, 347 mi. rural distr. lines, 11,700 kw. generating facilities, Newaygo Co., **$5,532,000.**

Mississippi—Yazoo Valley Electric Power Assn., Yazoo City, 75 mi. rural distr. line, sys. imprvs., Yazoo Co., **$405,000.**

Missouri—Black River Electric Co-operative, Ironton, 178.5 mi. rural distr. line, conversion 7.5 mi. lines, Madison, Bollinger and Wayne Counties, **$190,000.** Frank Horton & Co., Lamar, engrs.

North Dakota—L. S. R. Electric Co-operative, Milnor, labor for 204.55 mi. rural distr. lines, Richland and Sargent Counties, $75,000. Ulteig Eng. Corp., 111½ Front St., Fargo, engr.

Oklahoma—Southwest Rural Electric Assn., Tipton, 274 mi. rural distr. lines, sys. imprvs., 5 mi. tie lines and 2-way radio communication sys., Tillman Co. **$610,000.**

South Dakota—Moreau-Grand Electric Co-operative, Timber Lake, rural distr. lines, Dewey Co., **$115,000.** Scott Eng. Co., 10 2nd St. S. E., Watertown, consult. engr.

Tenn., Memphis—Memphis Light, Gas & Water Div., 179 Madison Ave., electric substation on Jackson Ave. near Buckeye plant, **$325,000.** W. B. Fowler, city engr.

Texas—Rio Grande Electric Co-operative, Brackettville, 185 mi. rural distr. lines, Val Verde Co., $175,000. Beavers & Lodal, 1408 Transit Tower, San Antonio, engrs.

Washington—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnish, del. f.o.b. cars shipping point or f.o.b. cars Odair, air compressors, and vertical air receivers, for Grand Coulee Power Plant and Grand Coulee Pumping Plant, Columbia Basin Proj., Spec. 2709. L. N. McClellan, ch. engr.

Washington—Bonneville Power Admin., 729 N. E. Oregon St., Portland, 8. Ore., 21.2 mi. North Bonneville-Troutdale 230 kv steel tower line, Skamania and Clark Counties, Inv. 4706. Plans deposit $25. L. C. Stewart, engr.

Wyoming—Bureau Reclamation, Dpt. Interior, Casper, furnishing, del. equip. for control board and battery charger and furnishing service of an erecting engineer for new Casper Substation, Kendrick Proj.

Low Bidders & Contracts Awarded

Alabama—Joe Wheeler Electric Membership Corp., Hartselle, 381 mi. rural distr. lines, Morgan Co., to Dent Constr. Co., Sheffield, **$534,513.** Bids 5/10.

Arizona and Nevada—Bureau Reclamation, Dpt. Interior, Phoenix, Ariz., June 16, foundations and erecting steel towers for Mesa-Coolidge 230 kw transmission line, Davis Dam Proj., Spec. 2670, from Ferd Drayer, Oakland, Calif., **$198,612.**

Fla., Jacksonville—City, City Hall, June 9, installing 69 kv. transmission cables and duct lines and cables for 13 kv subtransmission sys. for Power Plant 2, in South Jacksonville, from Harrison-Wright Co. & Assoc., 116 W. 3 St., Charlotte, N. C., **$1,873,000.**

Georgia—Slash Pine Electric Membership Corp., Homerville, 190.3 mi. rural distr. lines Clinch, Echols, Ware and Lanier Counties, from Keadle Bros. Co., Camilla, **$187,916.**

Ill., Chicago—City of Chicago, Dpt. Purchases Contracts & Supplies, City Hall, Dearborn St. Subway, Contr. P-4, to M. J. Boyle & Co., 2480 N. Elston Ave., **$1,196,683.** Bids 5/5.

Louisiana—Louisiana Rural Electric Corp., Alexandria, 247 mi. rural distr. lines, Grant, Natchitoches, Evangeline, Avoyelles and St. Landry Parishes, to Kincade & Lofton, Brookhaven, Miss., **$328,860.** Bids 4/4.

Mass., Somerset—Montaup Electric Co., Box 391 Somerset, design and construction 4 story, 15x250 ft., brick, steel, concrete power plant, 15 mi. rural distr. lines, 4 mi. steel towers, 11 mi. wood H frame, to Stone & Webster Eng. Corp., 49 Federal St., Boston, **$13,000,000-$14,000,000.**

Missouri—Nodaway-Worth Electric Cooperative, Inc., Maryville, 467.51 mi. rural distr. lines, Nodaway Co., to A. A. Electric Co., 3125 S. 60 Ct., Cicero, Ill., $674,347.

North Dakota—Verendrye Electric Cooperative, Velva, 575 mi. rural distr. lines, McHenry Co., to Sorkness Constr. Co., Fargo, **$635,664.** Bids 5/20.

O., Euclid—Lincoln Electric Co., 22818 Coit Rd., Cleveland, design and construction 1 story storage and admin. bldg., to Austin Co., 16112 Euclid Ave., Cleveland, **$8,500,000.**

O., Lancaster—Diamond Power Specialty Corp., 10340 Oakland St., Detroit, Mich., plant and office, 2 mi. east of here, off U. S. Route 22, to Austin Co., 16112 Euclid Ave., Cleveland. Approx. **$2,000,000.**

S. D., Rapid City—U. S. Engr., 1709 Jackson St., Omaha, Neb., June 10, electrical distr. sys. Rapid City Air Base, Inv. 25-066-49-135, from A. Tucker Electric Co., 619 Jackson St., Topeka, Kan., **$137,197.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

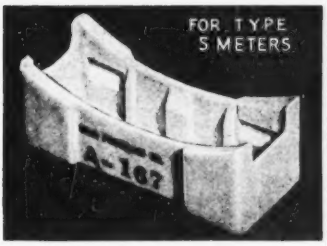
Ia., Iowa City—U. S. Eng., Clock Tower Bldg., Rock Island, Ill., Veterans Admin. general medical hospital, incl. main hospital, garage, laundry, apartment, appurtenant facilities, etc., 12 acre site south of U. S. 6, east of Woolf Ave. and north of Newton Rd. Approx. $8,000,000.

O., Cleveland—National Advisory Com. on Aeronautics, Brookpark Rd., plans by Burns & Roe, Inc., 233 Broadway, New York, N. Y., brick, concrete propulsion science laboratory at Brookpark and Guyton Rds., **$10,000,000.**

O., Lakewood—Owner c/o Cutting & Ciresi, archts., 2074 E. 36 St., Cleveland, five 10 story, brick, steel apartments, Edgewater Dr. from W. 117 St. west and incl. Paisley Estate. **$10,000,000.**

Low Bidders & Contracts Awarded

S. C., Spartanburg—Spartanburg General Hospital, c/o low bidder, June 9, hospital addn., from McKay-Werry Constr. Co., Spartanburg, **$1,072,000.**



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RECENT RATE CHANGES

Fort Pierce, Fla. CITY COMMISSION has reduced electric rates 10%, effective Apr 1. The decrease is made possible by the decline in price of fuel oil. A year ago, when fuel oil prices rose sharply, the commission placed a 10% surcharge on electric bills.

Pennsylvania Power & Light Co's proposed $2,240,000 annual electric service rate increase has been suspended for six months, from June 22, 1949 to Dec 22, 1949, by the state Public Utility Commission. The board has instituted an investigation to determine its reasonableness. PP&L said that the proposed increase, which would affect 496,552 of its 499,052 consumers in 28 eastern Pennsylvania counties, is necessary to meet "continued" high cost of labor and materials, EW, May 7, p 129.

Columbus & Southern Ohio Electric Co and City of Jackson, Ohio, have signed a new electric rate contract, which will save the city an estimated $5,000 annually.

Hillsdale, Mich., municipal power plant has reduced its rates approximately 2%. Decline in fuel costs made the reduction possible. The average consumer will save approximately 23 cents a month.

Prince George Electric Cooperative, Waverly, Va., has been authorized by the state Corporation Commission to establish a special rate for power used on farms and in homes for water heaters, effective July 1. The new rate will range from 2¢ per kwhr for power in excess of 500 kwhr per month to $2.75 per month for consumers of 40 kwhr.

Westmount, Quebec city council has authorized the municipal light and power department to revise its electric rates affecting space heating and hot water heaters. In the first meter reading after Aug 1, there will be a monthly service charge of 1.33¢ per kw installed capacity for space heating. In the case of the hot water heaters, effective with the first meter reading after June 1, there will be a service charge of 1.33¢ per kw of installed capacity on all heaters in excess of 3 kw.

•

Opens Glass Tubing Plant

Opening of a new plant at Logan, Ohio, for the production of glass tubing used in the manufacture of incandescent lamps, has been announced by the Lamp Department of the General Electric Co. The factory cost approximately $2,000,000. Plans call for the manufacture of small-diameter glass parts for incandescent lamps. It is expected that eventually the factory will produce tubes for regular and slimline fluorescent lamps. Having about 60 employees initially, the plant is expected eventually to have approximately 200 persons on the payroll. Manager of the new works is B. G. Greenman, Jr, who joined GE in 1937.

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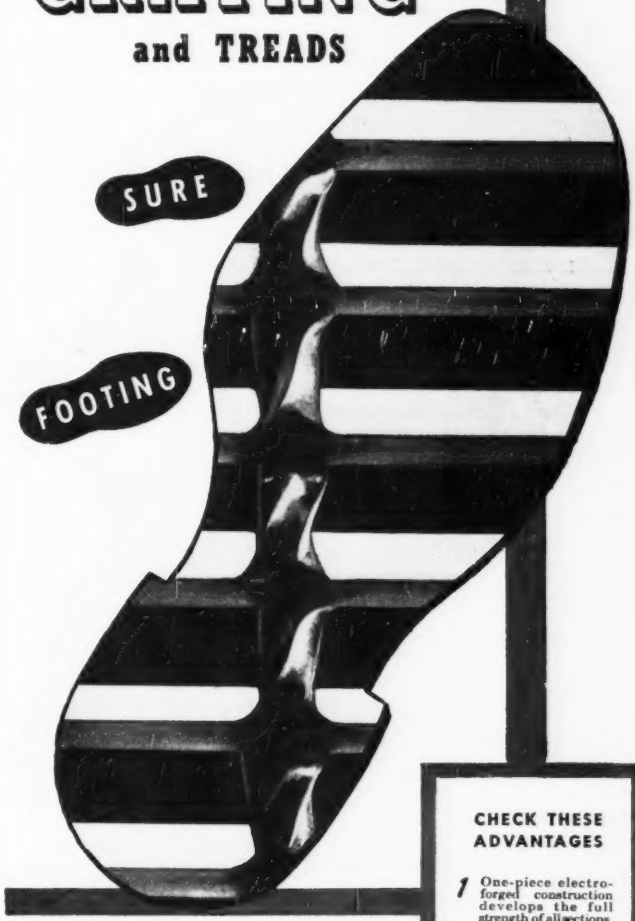

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P-9241, Electrical World, 330 W. 42 St., NY 18, NY

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ELECTRICAL ENGINEER, age 42, 20 yrs. experience in design, Supervision of Construction, Operation & Maintenance, with specialized study in relay & control installations & operation desires position with reliable Industrial or Utility as Supt. of Construction & Maintenance. Will locate anywhere. PW-9124, Electrical World.

METER AND Relay man. Age 39. Eight years test experience manufacture of relays, watt hour meters, KVA demand recorders. Last 2½ years assistant test supervisor polyphase watt hour dept. Seeking better position with utility company. PW-9316, Electrical World.

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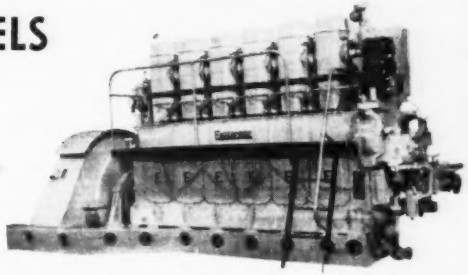

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6—333 KVA G-E	2400	240	480
2—200 KVA G-E	6900	1195OY	460 230 115
4—150 KVA G-E	22000	2300	4000Y
3—150 KVA G-E	6600	220	440
3—150 KVA W H	6900	460	230/115
3—150 KVA L-M	2400	4160Y	120 240
5—100 KVA G-E	33000	2300	
1—100 KVA G-E	13200	2400	
3—100 KVA G-E	11000	2300	4000Y
4—100 KVA G-E	6600	220	440
3— 75 KVA W-H	230	460	115 230 DRY
3— 50 KVA G-E	33000	2400	4160Y
3— 50 KVA Pitts	24400	2300	4000Y
3— 50 KVA W-H	4800	8320Y	120, 240
6— 50 KVA Pitts	2400	120	240
3—37½ KVA Mol	13200	2400	4160Y
6—37½ KVA Mol	13200	120	240
3 37½ KVA W-H	6600	220	440

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One Cutler Hammer make full voltage synchronous motor controller complete with Dynamic Braking oil circuit breaker and G. E. manual reverse oil circuit breaker, all in NEMA 1-A Dust Tight enclosure. Controller rated 250 H. P. 200 amps., 2300 Volts, 3 phase 60 cycle 250 volts D. C. Cutler Hammer Serial C-786665-A wiring diagram 117910-D4. G. E. breaker type FK-13, No. L-1918864. New in 1946.

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MOUNT MORRIS DAM BUILDERS
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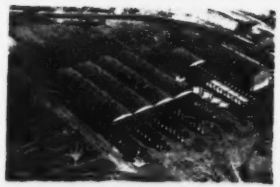

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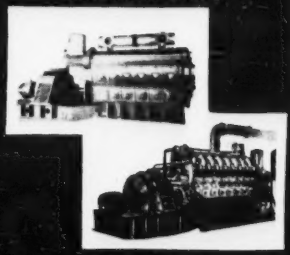
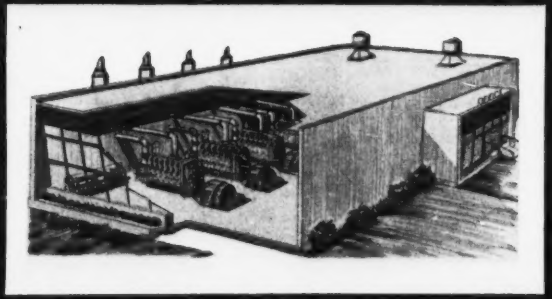
AERIAL VIEW OF OUR DIESEL SHOPS





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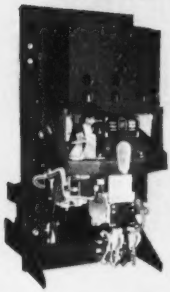

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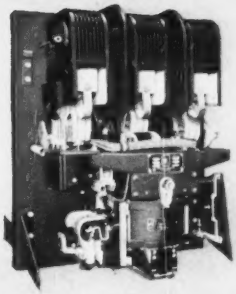

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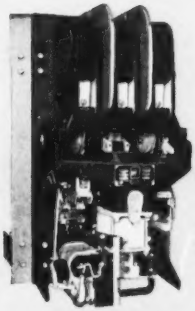

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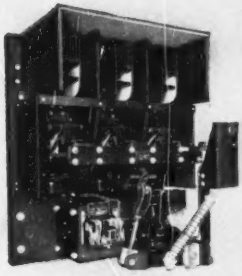

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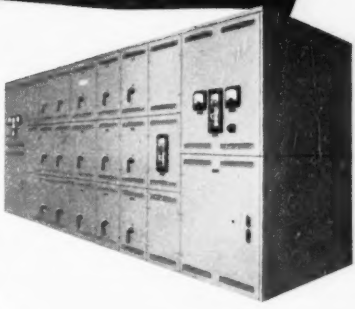

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CASE STUDY

Annual Savings in Turbine Lubricating Costs with Nonpareil Turbine Oil in a Midwest utility.

Turbine ..... 35,000 KW, 1800 RPM
Oil System Capacity .... 2800 gallons
Operation ... 1931 to 1937 on Turbine Oil X at 45¢ per gallon
Operation ... 1938 to 1948 on Nonpareil Turbine Oil at 87¢ per gallon
Annual Cost of Lubrication with Turbine Oil X $911.57*
Annual Cost of Lubrication with Nonpareil Turbine Oil ... $284.13*
Annual Saving 68.8%

CASE STUDY

Annual Savings in Turbine Lubricating Costs with Nonpareil Turbine Oil on a large utility turbine.

Turbine ..... 80,000 KW, 1800 RPM
Oil System Capacity .... 8,000 gallons
Operation ... Dec. 1935 to April 1942, on Turbine Oil Y at 39¢ per gallon
Operation ... May 1942 to Jan. 1948 on Nonpareil Turbine Oil at 88¢ per gallon
Annual Cost of Turbine Lubrication with Turbine Oil Y $575.30*
Annual Cost of Lubrication with Nonpareil Turbine Oil $503.93*
Annual Saving 12.4%

CASE STUDY

Annual Savings in Turbine Lubricating Costs with Nonpareil Turbine Oil in a Midwest utility system.

Turbine ..... 20,000 KW (Now 30 years old)
Oil System Capacity .... 550 gallons
Operation ... June 1940 to Aug 1944, on Turbine Oil Z at 55¢ per gallon
Operation .. Oct 1944 to Oct 1948 on Nonpareil Turbine Oil at 89½¢ per gallon
Annual Cost of Lubrication with Turbine Oil Z $83.90*
Annual Cost of Lubrication with Nonpareil Turbine Oil $69.49*
Annual Saving 17.2%

*Includes (1) cost of original fill—including interest charges, (2) oil replacements, (3) oil treating or sweetening, (4) cleaning turbine oil systems, (5) filter maintenance (where these items apply).

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STUDIES have been made of typical utility company operations to determine how much the *price* of turbine oil affects the *cost* of turbine operation. Three such studies are summarized here. In each case, the price of the original fill of oil was 38% to 55% *less* than that for Nonpareil. But in each case the total annual cost for lubrication, when all factors are considered, shows a saving with Nonpareil.

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